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Environmental Guidelines for Small-Scale Activities in Africa

Environmentally Sound Design for Planning and Implementing Humanitarian and Development Activities

Edited by:
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The material in these guidelines is advisory only and does not reflect official USAID legal opinion. However, USAID's Bureau of Policy and Program Coordination and Office of General Counsel have reviewed this report for consistency with USAID's Environmental Procedures 22 CFR 216. Comments on these guidelines are encouraged and can be sent to: Bureau Environmental Officer, Bureau for Africa, Office of Sustainable Development, Rm 2744 NS, Washington, D.C. 20523-0089.

Productive Sector Growth and Environment Division
Office of Sustainable Development
Bureau for Africa
U.S. Agency for International Development

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Contents

Foreword

Designing and implementing small-scale development activities can be difficult in Africa. Numerous guidelines and manuals on individual subjects have been produced through the years to assist in this kind of development at the ground level, but very few syntheses are available, especially few that are tailored to the needs of a donor agency and its immediate collaborators.

This set of guidelines synthesizes material from many sources, material produced by numerous organizations and individuals, especially over the last 10 years in Africa, often funded by the U.S. Agency for International Development (USAID). Our goal is to consolidate and update this technical information and to disseminate it widely for use by experienced development practitioners.

The Development Fund for Africa (DFA) at USAID has challenged us to scrutinize the effectiveness and impact of the Agency's projects in Africa and make needed adjustments to improve our development assistance programs. Donor agencies like USAID are increasingly looking to nongovernmental or private voluntary organizations (NGOs/PVOs) to provide effective implementation, and in turn, such organizations are searching out technical assistance to help their own development programs.

Environmental degradation poses a growing threat to the physical health and economic and social well-being of people throughout the world and underlies the importance of environmental protection at the local level. Explosive and poorly managed urbanization has contributed significantly to air, water, and soil pollution worldwide. Erosion and degradation of soils, loss of fertility, deforestation, and desertification beset rural communities, undermining food production and causing malnutrition and migration.

USAID is committed to helping people in Africa mitigate, and reverse where possible:

- impairment of human health due to air, water, and soil contamination from industrial, agricultural, and household activity;
- unsustainable exploitation of forest, wetlands, coastal zones, coral reefs, and other ecosystems that provide vital ecological services;
- degradation and depletion of water resources;
- unsustainable agricultural practices;
- inefficient and environmentally unsound energy production and use;
- inadequate management of household and municipal wastes in growing urban areas;
- regulatory, statutory, enforcement, and policy constraints; and
- social and economic patterns, including the lack of local participation and empowerment that contribute to the aforementioned problems or impede solutions.

These guidelines have been tested in draft form. They have been used by NGOs working under field conditions, and have already proven to be a useful adjunct in courses and workshops that strengthen institutional capacity. They have also been successfully used to design projects that are environmentally sound. We hope this edition will be more widely disseminated and helpful to our partners in development.

Curt Reintsma
Division Chief
Production Sector Growth and Environment

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These guidelines were produced with invaluable assistance of people within USAID, other branches of the U.S. government, and members of the PVO/NGO community. In August 1993, InterAction hosted a workshop in Washington, D.C. for USAID and members of the PVO/NGO community to review these guidelines for usefulness for PVOs/NGOs in the field. USAID missions in Gambia and Mozambique were kind enough to provide USAID perspective from the field. Draft versions of the guidelines have been field tested by mission environmental officers and PVOs in Africa. They were also used in conjunction with two of the Bureau's environmental capacity building courses for NGOs/PVOs, held in Zimbabwe in July 1995 and Mozambique in March 1996. Refinements from these events have been incorporated into this document.

Particular thanks for careful and thoughtful reviews are due to Idrissa Samba, regional environmental advisor in the Regional Economic Development Support Office (REDSO)/West and Central Africa in Abidjan. Special credit is due Robin Mason, USAID/Mozambique environmental officer, for her role in conceiving the Environmental Screening Form. USAID's Global Bureau staff and associated programs and activities reviewed the sectoral guidelines with technical eyes. Representatives from U.S. and African PVOs took time to respond to the draft with comments and advice.

USAID hopes that the spirit of cooperation between the Agency and the PVOs/NGOs that helped bring these guidelines together promises a positive trend in partnerships in the future. Everyone can benefit from such cooperation.

Also essential to this process was the review for legal accuracy of the sections relating to USAID's Environmental Procedures by the Agency Environmental Coordinator, James C. Hester, and by the General Counsel's (GC) office in USAID, especially Mary Alice Kleinjen, formerly GC/AFR, and Drew Luten, GC/AFR.

Original material for these guidelines was provided by Gregory Booth (Agroforestry, Ecotourism, Environmental Mitigation during Refugee Relief, Fisheries Management, Food Aid, Humanitarian Assistance and the Environment, Integrated Conservation and Development, Resettlement Activities and the Environment, and Timber Harvesting and Production); Angel Chiri (Agricultural Pest Management); Dan Dworkin (Monitoring and Evaluation); Walter Knausenberger (Agriculture, Food Aid, Humanitarian Relief and the Environment, Environmental Assessment Principles and Procedures, USAID Pesticide Procedures, and Safe Pesticide Use Guidelines) and Peter Sam (Waste Management).

Appendix F provides a listing of key contacts and reviewers for these guidelines.

Executive Summary

Over the past several years, USAID has been steadily increasing its cooperation with PVOs and NGOs. During this time, increased reliance on the PVO and NGO community has stimulated an interest in developing environmental guidelines to ensure that such activities are consistent with USAID's environmental regulations.

The purpose of the guidelines is to promote environmentally sound development activities that build on principles of sustainable natural resource management. These guidelines represent a key element of the Bureau for Africa's environmental management capacity building strategy, in which greater responsibility is devolved to collaborators in the field.

The guidelines aim to provide PVOs and NGOs, and other recipients of USAID grants, a tool for activity design, implementation and monitoring. The focus is on smaller-scale field activities. While intended primarily for use by experienced staff of PVOs and NGOs who engage in development and humanitarian activities in Africa, the document may also prove a useful reference tool for USAID field staff and other collaborators.

Presented are 18 diverse but interrelated sectors as agriculture, agroforestry, livestock, ecotourism, energy, water supply and sanitation, resettlement, and integrated conservation and development. Several new thrusts are represented, such as "Food Aid, Humanitarian Relief and the Environment." For each sector, key questions and suggested actions are included to help resource planners during discussions of strategies for alternative activity design and mitigation. Also addressed in a compact fashion are the principles and practices of environmental assessment, including a synoptic overview of the pertinent USAID environmental procedures and strategies and regulatory documents.

In many of the sectors covered, the benefits of pesticide use could be offset by potentially harmful effects on the environment. For this reason, expanded Appendix sections provide guidelines for safe pesticide use and integrated pest management.

An Environmental Screening and Reporting Form (ESF) is introduced which will allow streamlined review of proposed activities in a fashion which is consistent with all salient Agency policies and procedures. Use of the ESF will greatly reduce the need for review and approval of grant activities at the Washington level.

The authors recognize that sound environmental design and implementation must be tailored to the local conditions of each project and that a particular activity detrimental in one instance may be beneficial in another. Thus, these guidelines are intended not as hard and fast rules but as a basis from which to encourage creative thinking and discussion about the many complex issues involved.

Glossary of Acronyms and Abbreviations

ADO	agricultural development officer
AEC	Agency environmental coordinator
AFR	Bureau for Africa (USAID)
ANR	agriculture and natural resources
AT	action threshold
BEO	bureau environmental officer
BOD	biochemical oxygen demand
BSP	Biodiversity Support Program
CAMPFIRE	Communal Areas Management Program for Indigenous Peoples Project (Zimbabwe)
CBO	community-based organization
CCIC	Canadian Council of International Cooperation
CE	categorical exclusion
CEQ	Council on Environmental Quality (United States)
CFR	Code of Federal Regulations (United States)
22 CFR 216	Title 22 of the CFR Part 216, U.S. federal regulations representing USAID's environmental procedures
CIP	Commodity Import Program
CODEL	Cooperation in Development (consortium of NGOs)
CSP	Country Strategic Plan
DANIDA	Danish International Development Agency
DFA	Development Fund for Africa
EA	Environmental Assessment
EIL	economic injury level
EIS	Environmental Impact Statement
EMEMP	Environmental Evaluation, Monitoring and Mitigation Plan
ENCAP	environmental management capacity building

ENR	Office of Environmental and Natural Resources (USAID/G)
ENV	Environmental Protection Unit (technical unit in USAID/AFR/SD/PSGE)
EPAT	Environmental and Natural Resources Policy and Training (USAID project)
E/NRM	environmental/natural resources management
ESA	East and Southern Africa
ESF	Environmental Screening and Reporting Form
FAA	U.S. Foreign Assistance Act
FAO	Food and Agricultural Organization
FSN	Foreign Service National
G	Bureau for Global Programs, Field Support, and Research (USAID)
GIS	geographic information systems
GMU	grants management unit
GTZ	Deutsche Gesellschaft für Technische Zusammen-Arbeit (German Technical Cooperation Agency)
H.R.	House resolution (U.S. Congress)
ICI	Intermediate Credit Institution
ICDP	integrated conservation and development project
IEE	Initial Environmental Examination (USAID environmental review procedure)
IPM	integrated pest management
LC	local currency
M&E	monitoring and evaluation
MEO	mission environmental officer
NEAP	National Environmental Action Plan
NESDA	Network for the Environment and Sustainable Development in Africa
NGO	nongovernmental organization
NPA	nonproject assistance
NRM	natural resources management
PARTS	Policy, Analysis, Research, and Technical Support (USAID/AFR/SD project)

PEA	programmatic environmental assessment
PRA	participatory rapid appraisal
PSGE	Productive Sector Growth and Environment Division (USAID/AFR/SD)
PL	public law
PVO	private voluntary organization
REA	regional environmental advisor (REDSO)
REDSO/ESA	Regional Economic Development Support Office, East and Southern Africa (Nairobi, Kenya)
Reg. 16	(informal shorthand for 22 CFR 216)
REO	regional environmental officer
SD	Office of Sustainable Development (USAID/AFR)
SO	strategic objective
T&V	training and visitation
TIP	technical inform packages (USEPA)
UNDP	United Nations Development Program
USAID	U.S. Agency for International Development
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
VITA	Volunteers in Technical Assistance
WCA	West and Central Africa

1. About These Guidelines

1.1 BACKGROUND AND PURPOSE

To implement its development assistance programs, USAID is relying increasingly on its partners in non-governmental organizations (NGOs) and private voluntary organizations (PVOs).* These guidelines were developed to assist PVOs and NGOs in integrating environmental concerns into activities and programs, with the intent that, increasingly, USAID personnel will need to provide only minimal oversight.

In September 1992, a limited set of provisional environmental guidelines was produced to accompany USAID assistance via NGOs/PVOs to cope with the drought emergency in southern Africa, often in situations in which USAID had no presence. While that document served its purpose, the need for a more comprehensive, "stand alone" version led to the creation of these guidelines.

The purpose of these guidelines is to:

- promote environmentally sound development activities, incorporating principles of sustainable natural resources management;
- provide PVOs and NGOs with a reference tool for writing concept papers and proposals, as well as implementation plans and associated monitoring, evaluation, and mitigation plans within the context of USAID's environmental procedures;
- provide USAID with a reference tool for evaluating and classifying project concept papers; proposals; implementation plans; and monitoring, evaluation, and mitigation plans; and
- meet the needs of development workers at the community level, helping them to analyze proposed and ongoing activities to maximize positive impacts and aid in reporting these impacts.

Improved natural resources management is known to increase agricultural productivity and promote economic development. Nonetheless, sustainable development cannot be assumed to be an automatic result. Unintended negative environmental consequences should be anticipated so that mitigating and environmental protection measures can be incorporated in the development process early in the planning stages, that is, prior to implementation. For this reason, NGOs and PVOs should anticipate reasonably foreseeable impacts on the environment and design alternative actions, companion projects, and monitoring systems to minimize these effects.

1.2 WHO SHOULD USE THESE GUIDELINES?

The intended users of these guidelines are NGOs and PVOs based or operating in Africa, and engaging in:

- emergency relief and disaster rehabilitation activities, including food-for-work, in countries that suffer from drought and civil strife;
- a broad spectrum of longer-term development activities, including agriculture, rural development and natural resources management;
- integrated conservation and development activities, which require careful balancing of biodiversity and ecosystem protection objectives with the economic and social development needs of human populations; and
- smaller-scale activities at the community level, often within umbrella projects, in which the in-

* In these guidelines, the expression PVO refers mainly to international organizations with their headquarters outside of Africa, while NGO refers to indigenous national or regional institutions in Africa.

dividual investments would typically be under $100,000, but in the aggregate may surpass $1 million.

Other development partners will also find the guidelines of use, particularly in evaluating specific proposals and activities already being implemented. USAID's field staff, collaborators, and other partners may find this document to be a useful reference tool.

The guidelines represent an *aide memoire* for experienced development professionals and are not a substitute for detailed sources of technical information in the various sectors or for design manuals for projects implemented by PVOs and NGOs. It is assumed that users will have the necessary background and experience to cover the technical aspects of project design; readers can refer to the accompanying list of references for additional information.

These are guidelines only and have no legal standing. Please refer to Section 5 for a fuller description of the regulatory context and to Appendix E for the actual text of USAID's Environmental Procedures (22 CFR §216).

1.3 HOW TO USE THESE GUIDELINES

These guidelines should be useful to NGOs and PVOs as an activity design tool. The guidelines are also intended to provide USAID and other development workers with an evaluation tool in assessing proposals. Further, NGOs, donors, and collaborators can consider the guidelines as a reference tool to aid assessment and adaptive implementation of ongoing projects.

Designing the Activity

Step 1*: Identify Important Environmental Issues and Opportunities*

Use Section 2 to gain a perspective on principles of environmentally-sound design, and Section 3 to learn about the problems and opportunities that may be associated with your proposed project. Using this and other information, begin to identify the following with the participation of all stakeholders:

- key questions, assumptions, and information requirements for the project;
- whether the proposed project would be strengthened through joint submission with another NGO with a comparative advantage in one of the project components;
- a step-wise development process and associated interventions that will lead to the targeted accomplishments (identify project phases, associated activities, linkages, and potential impacts using a simple matrix);
- significant environmental issues and opportunities associated with the proposed project;
- an impact monitoring and evaluation plan and description of how the project can be adjusted and impacts/lessons learned assessed; and
- human and financial resources and methods to mitigate field activities.

Step 2*: Synthesize Results of Discussions in a Concept Paper, Preproposal, or Proposal*

The concept paper should identify:

- the best management interventions and policies used in the project, based on national and regional information from similar projects (best management practices would ultimately be based on environmental assessment findings); and
- how ongoing monitoring of environmental impacts will be managed and mitigated throughout and beyond the life of project.

Evaluating Proposals

Concepts and proposals can be evaluated according to the extent to which the principles listed above and in the frameworks in Section 2 are adhered to. The lists of Key Questions and Suggested Actions by sector in Section 3, along with the tools reflected in the appendixes, are also intended to assist evaluation and review.

Addressing Adaptive Program Assessment and Implementation

Consider using these guidelines to promote appropriate follow-up, monitoring, and adaptive implementation. The idea is to identify direct, indirect, and induced impacts and to promote the mitigation of unanticipated undesirable impacts.

The guidelines are intended to encourage flexibility built on the strength of intrinsically sound design from environmental and socioeconomic perspectives. The Guidelines are also consistent with the concept of umbrella projects, endowments and other mechanisms that serve as a conduit between USAID and NGOs, allowing for flexibility, innovation, and creativity while maintaining clear lines of reciprocal responsibility.

USAID, as a "reengineered, learning institution," has introduced major changes in its new operations systems; for example, replacing projects with "results packages." The changes are key to providing USAID's operating units and collaborators the flexibility they need to adapt to changes during implementation. The underlying rationale is to focus on results, while still managing inputs and monitoring outputs properly, and to give those responsible for achieving results the flexibility to change approaches and tactics as situations change or as lessons are learned.

2. Linking Sustainable Development and Environmental Protection

2.1 PRINCIPLES AND FRAMEWORK FOR ENVIRONMENTALLY SOUND DESIGN

Understand the Policy Context and Enabling Conditions

The following enabling conditions facilitate sustainable environmental management:

- legal and policy framework enabling sustainable private-sector initiatives;
- institutions and human resources to apply laws, policies, and information;
- clearly defined national objectives;
- information regarding national environmental resources (e.g., assessments or management plans); and
- appropriate environmental practices.

In developing countries and those in transition, agricultural growth is important for overall economic growth and the alleviation of poverty and food insecurity. Macroeconomic, trade, and sector policies are important for agricultural growth and sustainability.

To address medium- and longer-term impacts of development activities, the most effective and least management-intensive approach is to build capacity through policy reform, institutional support and strengthening of the NGO/PVO community, and the public's participation and empowerment through the political process. The object is to let Africans take charge of the environmental movement, directly at the grass roots level. This will help to evoke political support for environmental and natural resources management as a governmental priority.

Ensure Community Participation

Promoting genuine and effective participation of the populations involved or influenced by development activities is the shared responsibility of all parties. Activities should involve local beneficiaries from the beginning of the design process. When they participate in a project's design and implementation, local resource users are more likely to develop a sense of responsibility and ownership. They are also more likely to work with project managers to mitigate adverse environmental impacts.

Local resource users are often knowledgeable about environmental and associated issues, which can be invaluable during project design. Such users are also often best at monitoring long-term environmental impacts associated with the project.

Participatory techniques and methods need to be more widely available to NGOs through training, and the use of these tools should be further developed and consistently applied. An example is the application of Participatory Rural Appraisal techniques to the development of the priority issues to be addressed in the Andasibe-Mantadia integrated conservation and development project in Madagascar.

Consider Gender and Equity Perspectives

Women, as important players in food production, natural resource management, and economic systems, constitute a major stakeholder group. Though their contribution may not always be obvious, women play a critical role in their communities. They must be integrated into development projects as both participants and beneficiaries to meet the dual objectives of better resource management and improved community welfare.

Box 2.1 Namibia: Gender Factors in Natural Resources Management

Gender factors play a central role in natural resource management. The responsibility for monitoring and managing a given resource may fall along gender lines. For example, in Namibia some pastoralist women have begun to sell woven palm frond baskets, traditionally used to store milk, to tourists. In order to prevent harmful increases in consumption of palm leaves, tree counting and monitoring was transferred by conservationists to the male lineage heads of the community. Women traditionally controlled the rights over milk and its distribution, symbolized by the keeping of the milk in the palm frond baskets. With men now monitoring the trees from which the baskets are made, women began to feel that their rights over milk distribution were under threat. They began to overharvest fronds from certain trees, killing some of them, to intentionally ignore the old way of managing palm trees. The lineage heads blamed the women as lazy, but the women explained their rationale for doing so. Once responsibility for the trees was returned to women, they continued to harvest fronds for baskets in the old way of cutting only a few from each tree, and the palms thrived. The women observed that it was in their interest to protect the resource from which they earned income. Resource tenure and property rights often influence patterns of natural resource management or mismanagement. Such rights vary among cultures and are frequently gender-specific. Understanding the distribution of these rights among states, communities, families, and individuals is essential to making informed decisions that promote and encourage sustainable use of the resource base.

Source: Adapted from Brown and Wyckoff-Baird, 1992.

As both users and managers of the natural resources base, women have extensive knowledge of their environment. They often have indigenous knowledge unknown to men in the community, especially regarding such subjects as gathered foods and certain medicines. This knowledge should be tapped during project planning sessions such as scoping and environmental impact assessment.

Consider a Training Element for All Sector Activities

Environmental education and training should be important parts of projects in all sectors. Project planners and community participants alike need to be trained adequately to recognize how project activities can affect the environment in order to foresee their adverse impacts. They should be able to examine ways in which sound environmental management and sustainable development can occur simultaneously.

Education and training activities could include environmental education in schools, teacher awareness training, training of extension workers, and workshops for journalists (to promote public dialogue of environmental issues). Government agencies, even if not directly involved with a project, need to be informed in order to deal with any indirect effects of project activities. There are many potential ways to achieve this goal, and locally appropriate methods of doing so should be explored.

Identify Regional Lessons: Learning from Each Other

NGOs recognize the importance of increasing regional sharing and learning. Similar biological and socioeconomic conditions often characterize Africa's geographical regions. For this reason, there may be opportunities to apply lessons learned in one country to others within a particular region. However, one NGO may sometimes be unaware that another NGO

is conducting a similar implementation activity within a particular area or region. Regional coordination and the use of consistent field methodologies can facilitate the sharing of lessons learned regarding potential environmental impacts associated with rural development activities.

NGOs and PVOs with their collaborators need to create more mechanisms for intercountry exchanges. Building on existing models like USAID's NGO/PVO NRMS Project, ways can be found to cost-effectively access the work of colleagues tackling similar problems and share experiences at the ground-level. Prime examples include community-based natural resources management projects and integrated conservation and development projects.

Seek to Standardize Methods Among NGOs

The use of standardized field methodologies can ensure that lessons learned by one NGO can be used by others. Some examples of implementation activities that incorporate an array of field methodologies are socioeconomic, such as participatory rural appraisals, biological surveys, and management plan development.

Monitor and Evaluate: Toward Adaptive Program Implementation and Mitigation

Project budgets should identify funding sources and responsibility for monitoring and evaluation from the onset of project design. Monitoring should be seen as an opportunity to test assumptions, identify linkages, modify implementation activities, and share lessons learned locally and regionally. Monitoring must support an NGO's management functions. Special efforts are also needed to reduce the typically passive role of the resource user community in this context. For example, monitoring and evaluation can be used as collaborative tools in a training and learning context.

An ongoing monitoring process should be established as part of a project (see Section 4). This includes the gathering of environmental impact information during project design, the initial environmental examination, environmental assessment activities, and project implementation (see Section 5).

Some flexibility and a learning curve need to be built into environmental programs in order to accommodate the tremendous flux to be experienced in the development arena. While it makes sense initially to focus attention on implementing the existing program concept, an NGO should maintain some ability to change, since a directed activity focused only on the initial goal can encounter operational problems (of showing impact, managing activities, etc.) in future years. In particular, managers must be able to make adjustments and take mitigative steps to deal with unanticipated negative impacts.

2.2 AFRICAN NATIONAL CONTEXT

Sectoral, Policy, and Institutional Change and the Environment

Project planners should assess the national economic policy context within the country in which a project is to be implemented. These factors could affect project implementation significantly. Armed with this knowledge, project planners can modify project design to compensate for these policies.

Many African governments are pursuing sectoral or structural adjustment programs to stimulate economic growth and international trade. While often necessary for the national economy, these reforms can influence—both positively and negatively—how resource users manage their environment.

Some examples of macroeconomic tools used in such programs include altering exchange or interest rates, reducing government budgets, promoting market liberalization, and enhancing the role of the private sector. Improving land tenure rights and providing resource users with access to financial services can, in some cases, promote sustainable environmental practices. Nevertheless, negative environmental consequences can occur if economy-wide reforms are undertaken while market or institutional imperfections are in effect.

Answering the following questions can provide information that can be useful in assessing the national economic policy environment as it relates to project design:

- What are the national laws and regulations regarding resource management, and how are they enforced?
- What structural adjustment, policy reform, or other macroeconomic initiatives are being conducted or planned nationally and regionally, and what has been the resulting experience?
- What are the current land-tenure systems and tree-ownership or usufruct customs in the project area, and how will they affect resource users' adoption of interventions?

National Environmental Action Plans

National Environmental Action Plans (NEAPs) are intended to be demand-driven, action-oriented national strategies that integrate environmental management into a country's economic development process. The first NEAP was launched in Madagascar with World Bank assistance in 1987. By 1995, more than 30 NEAPs had been initiated in Africa, and more than 50 worldwide. The Bank often facilitates the NEAP process through the coordination of donors and mobilization of needed donor support.

The Bureau for Africa has played a significant role in the NEAP process since its inception, providing direct support in several sub-Saharan African countries, as well as support to the Multidonor Secretariat at the World Bank to promote design and implementation, donor coordination, networking, and information and analysis activities. USAID/AFR has also been instrumental in the formation of the Network for Environment and Sustainable Development in Africa (NESDA), an NGO based in Abidjan intended to promote participation by Africans, help share lessons learned across countries, and to link the best expertise available on the continent to promote and sustain sound environmental planning and the full integration of environmental sustainability in development plans and policies.

The objective of the NEAP planning process is to develop a framework for a coordinated multisectoral national environmental program. A NEAP has the potential to provide an economic development context for long-range environmental and rural development planning. NEAPs can help countries to:

- simplify and coordinate international frameworks;
- increase the flexibility of financial flows to implement strategies and action plans in accordance with national priorities;
- defer to national leadership, coordination, and priorities, as appropriate;
- develop human resources and transfer technology to reduce dependence on external assistance;
- develop mechanisms for public- and private-sector participation and monitoring of planning progress; and
- support subregional dialogue and coordination mechanisms around issues of common interest.

NEAPs encourage broad-based participation, especially by NGOs and PVOs, providing a vehicle for the public to express its opinion on issues of interest for the nation. Furthermore, the ongoing, long-term nature of the process results in the involvement of a large number of people. In Madagascar, for example, approximately 150 Malagasy were involved when the NEAP started; more than one thousand people participated during the process.

The role of NGOs and international donors is to assist countries in developing and implementing these plans. In coordination with NGOs, governments are in a position to identify environmental problems, develop a comprehensive environmental policy to address environmental problems, and provide specific plans of action. Issues addressed as part of the NEAP process can include:

- actions required to combat or minimize environmental problems;
- ways and means by which existing or planned projects and programs can be modified to account for environmental concerns; and
- environmental investment plans that incorporate environmental impact assessments.

The NEAP process emphasizes close coordination between national governments and the participating international community (e.g., donors, NGOs, and local community). Participating NGOs potentially can influence the decision-making process and gain experience in negotiating with national governments and donors.

NEAPs are designed to be managed primarily by national institutions, not NGOs; however, NEAPs can be instrumental in facilitating the involvement of regional and local organizations to ensure full participation of resource users. To a large extent, the success of NEAPs depends on their links with NGOs and the involvement of civil society.

To ensure full participation in a NEAP, a negotiation process should be conducted among NGOs, the local community, and NEAP representatives. The potential benefits and costs associated with NEAP participation should be clearly understood. NGO participation in the NEAP process should be encouraged during initial NEAP planning activities. For example, NEAP scoping sessions should assess the capacity of the NGO community (both local and international) to participate in environmental planning and management. It is important to maintain NGO participation during the NEAP process and also in its implementation. Experience has shown that a critical NEAP issue is how to maintain NGO participation.

A key issue to emerge from the NEAP experience is whether and how Africans pursue the effort once the NEAP process is initiated. Africans must be responsible for the sustainability of NEAP activities. The early momentum, because of the high political profile, must be translated into a realistic, long-term in-country approach with appropriate measures built in to ensure that recurrent costs are met and that NEAP components are designed to be self-supporting. Environmental sustainability can occur only if the public is directly concerned and supportive. The public will expect the NEAP process to bring an end to the continued degradation of the environment and quality of life.

2.3 REGIONAL COORDINATION

Background

Africa is culturally, ecologically, and politically diverse. Such diversity calls for specific strategies and programs. One valuable approach to addressing this diversity is to think of environmental priorities on the basis of geographic and ecological zoning.

For this reason, USAID/AFR recognizes the following six agroecological zones within sub-Saharan Africa for management purposes:

- arid and semiarid tropics (Sudan-Sahelian belt and much of southern Africa);
- subhumid tropical uplands;
- African highlands (tropical highlands and subtropical highlands;

- humid coastal lowlands (humid West Africa);
- humid equatorial lowlands (Congo Basin); and
- Madagascar and Indian Ocean islands.

Despite the significant differences among zones, common conditions often characterize each of the regions. For example, the World Bank's agenda for its assistance to sub-Saharan Africa characterizes subregional specificities and its environmental priorities. While often politically heterogeneous, countries within a particular geographical region often share similar cultural, ecological, and population characteristics. For this reason, there may be opportunities to apply promising field interventions in a number of countries, if favorable policy conditions exist.

Absence of regional coordination can result in limited sharing of lessons learned regarding potential environmental impacts associated with rural development activities. This lack of shared information could potentially result in poorly designed and implemented projects, use of ineffective or environmentally unsafe field methodologies or interventions, and poorly monitored activities that inhibit both adaptive management and the improvement of projects.

Some major reasons for poor regional coordination include a history of competition between NGOs for donor grants or publicity, unavailability of financial resources from the NGO or donor for travel to other project sites, lack of professional incentives for field staff to participate in coordination efforts, and limited time to participate in coordination efforts while conducting field activities.

Key Questions for Regional Coordination

- What are the country's agroecological zones?
- What have been the positive and negative environmental impacts associated with development initiatives within these zones?
- Which organizations in the region are conducting regional activities?
- Are there protected areas in the country that are contiguous with present or potential protected areas in another country? What are the opportunities to share information?
- Are activities currently being implemented in the region in which a specific project/program is planned?
- Are activities being conducted in other sectors that could be linked to the management activity (e.g., agricultural research, small enterprise development, or energy)?

Suggested Actions for Regional Coordination

While USAID's umbrella grant programs have selection criteria, not every program requires or suggests standardized field methodologies for NGOs. USAID's grant program manager should consider taking responsibility for standardizing field methodologies and providing funding for regional coordination within NGO grants.

Some examples of this standardization are: effective field methodologies in coordination with the NGO community, identifying lessons learned from NGO activities regarding positive and negative environmental impacts (e.g., NGO workshops), and providing sufficient financial resources within grants to allow NGOs to participate in regional coordination activities.

Regional coordination may require negotiating across well-defined political and legal jurisdictions. Potential barriers include administrative conflicts, disciplinary domains, differing national cultures, conflicting ethnic groups, and adversarial relationships among communities or organizations. The development community should work together to develop creative approaches to minimize these barriers.

NGOs and USAID missions should conduct regional workshops to share lessons learned. These workshops should facilitate communication networks between projects within a region, project site visits and exchange programs, development of regional projects, and coordination between NGO projects and regional multisectoral projects, such as those of the International Center for Research in Agroforestry (ICRAF).

In a recent stakeholder survey for regional agricultural and natural resources management programs in southern Africa under USAID's Initiative for Southern Africa, the following priorities were identified:

- harmonizing regional trade, pricing, and marketing policies and sharing market information;
- improved policy analysis at the regional and national level;
- shared research and development with technology transfer networks to support farmers with demand-driven technologies;
- regional assistance and sharing of experiences on community-based natural resources management;
- regional promotion and planning of community-based ecotourism;
- regional management and planning of water resources;
- shared experiences in regional resource assessment (GIS, global climate change, NEAPs);
- cross-national and regional cooperation in preservation and management of biodiversity;
- shared environmental education and communication experiences; and
- regional harmonization of environmental regulations and assessments.

2.4 USAID'S REGULATIONS AND GUIDELINES

Introduction

USAID's strategies for sustainable development identify the Agency's threefold environmental objective as:

(1) to safeguard the natural resources underpinnings of broad-based economic growth;

(2) to protect the integrity of critical ecosystems; and

(3) to alleviate and prevent environmental threats to public health.

Further, the Bureau for Africa's developmental and environmental strategy, the "Plan for Supporting Environmental and Natural Resources Management in sub-Saharan Africa" (PENRM), directly guides bilateral and regional programming in a manner that addresses overall Agency objectives.

Environmental sustainability is integrally linked to USAID's overall development goal. To meet this goal it is essential that environmental considerations be incorporated into results planning, achieving, and monitoring—in the terminology of the Agency's reengineered Operating Systems and the new Automated Directives System (ADS). These Guidelines are seen as aiding USAID missions and collaborators in Africa to meet a critical need for systems, guidelines, technical assistance, and training to upgrade their capacity to implement effective environmental review and program implementation. USAID's new ADS and Operations System has heightened expectations in regard to programming consistent with the Agency's Environmental Procedures and with principles of environmental soundness.

USAID recognizes that its success will be determined by the way it approaches its development mission and responds to urgent humanitarian needs. To meet the challenges of the post-Cold War world, USAID will use the following operational methods in all its endeavors:

- support sustainable and participatory development;
- emphasize partnerships; and
- use integrated approaches to promote development.

Environmental Regulations and Statutory Requirements Applicable to USAID Assistance

In addition to the general guidelines and strategies applicable to USAID as a whole, the Agency operates under a number of regulations to implement its environmental program activities.

For specific guidance on conducting environmental reviews consistent with USAID's procedures, consult Section 5.2 and Appendixes A, E, and F.

Some of the more important regulations are:

- USAID's Environmental Procedures: 22 CFR 216 (Regulation 216, or "Reg. 16");
- Foreign Assistance Act Amendments (P.L. 87-185 as amended): Environmental and Natural Resources (Section 117 of the Foreign Assistance Act Amendment);
- Tropical Forests (Section 118 of the Foreign Assistance Act Amendment);
- Endangered Species and Biological Diversity (Section 119 of the Foreign Assistance Act Amendment); and
- Nonproject Assistance and Environmental Impacts (Section 496(h)(2)(b) of the Foreign Assistance Amendment Act).

The Bureau for Africa's Program

The Bureau seeks to promote broad-based and sustainable economic growth. Achieving this goal requires that adverse environmental effects be minimized. Several key attributes in this regard are: establishing partnerships between USAID and NGOs/PVOs, flexibility and willingness to learn, and a long-term agenda.

The Bureau aims to work through NGOs/PVOs, using their grassroots approach, to improve USAID's ability to monitor project activities and mitigate whatever environmental problems arise. Through improved monitoring, such activities can help Africans help themselves more effectively .

Box 2.2 USEPA Technical Information Packages

The U.S. Environmental Protection Agency (USEPA) has prepared a series of informational brochures on environmental and public health issues for the international community. These summarize the key points of various subject areas, and contain a bibliography.

Available Technical Information Packages appropriate for the small-scale development activities covered in this volume include:

- safe drinking water;
- disposed of pesticide waste;
- disposed of solid wastes;
- small community wastewater systems;
- risk assessment;
- guidelines in the use of pesticides; and
- environmental impact assessments.

Please consult the *References* section for more information on these materials and how to obtain them.

3. Implementation Guidelines By Sector

These guidelines reflect the spirit of sound design and implementation principles for small-scale projects. They are consistent with good practices that USAID recommends as well as USAID's Environmental Procedures (Section 5.2). The sectoral treatments follow a consistent outline, identifying the problem, describing potential environmental impacts, and possible causes of negative impacts of activities.

The information can help resource planners think about the development process associated with the planned activity. "Key Questions and Suggested Actions" are provided to facilitate discussions among parties concerned with project design, implementation, evaluation, and mitigation.

Use these detailed checklists (for example the "Key Questions") as an important method of assessing the possible impact of a project on the environment. Checklists should always be used with the people in the community, respecting and incorporating their local knowledge.

An important purpose of the sectoral guidelines is to aid in monitoring and assessing for impacts that we wish to anticipate, prevent if possible, and mitigate or lessen, if and when necessary. These impacts can be direct or indirect (see Section 5). Mitigation requires the effective application of information (gained through the monitoring and evaluation process—see Section 4) to the planning and implementation of timely, appropriate, and effective corrective adjustments and improvements in program activities.

If you need more background or technical information on the subjects treated, consult the "References and Further Literature" section at the end the Guidelines.

3.1 AGRICULTURE: SOIL AND WATER RESOURCES, INCLUDING IRRIGATION

Problem Identification

Land in Africa is under increasing pressure to expand productivity to feed the continent's growing population. In response to this demand, some farmers are shortening fallow periods on land already in use or expanding cultivation onto marginal lands. As a result, much land is showing signs of degradation.

Unfortunately as well, Africa's agricultural sector has been relatively unproductive as the result of a complex and interrelated series of resource-degrading practices and inappropriate policies. Agricultural projects should be conceptualized to respond to these complex interrelationships and to site-specific physical, social, economic, and institutional circumstances surrounding them.

Some of the agricultural activities most likely to have environmental impacts are water supply, irrigation, and drainage; fertilizer and nutrient management; land clearing and cultivation; and chemical use in pest management.

Soil and water conservation practices include all measures that improve or preserve the land's productivity. Techniques of erosion control tend also to contribute to water retention. Some measures for improving soil fertility can, through their effect on the production of organic matter, improve soil structure. This ultimately increases both the resistance of the soil to erosion and the water-holding capacity of the soil. The efficiency of fertilizer use is also a function of soil moisture.

This section discusses soil resources and erosion, water resources and irrigation, nutrient runoff, introduction of new species, and clearing vegetative cover. Section 3.12 discusses the management of agricultural pests.

Potential Environmental Impacts

Unsustainable agricultural practices and associated policies are some of the leading causes of natural resource degradation in Africa. Agricultural expansion often results in loss of vegetation and biodiversity. Loss of vegetation increases soil erosion, resulting in reduction of soil fertility in many areas of sub-Saharan Africa.

Improper use of pesticides, insecticides and fertilizer (nitrate pollutants) is an important cause of pollution in the agricultural sector. Water pollution by toxic organic compounds and metals or by nutrient loading from agricultural runoff can cause biological stress on aquatic ecosystems. Chemical pollution can harm the food value of edible fish species and threaten poorly drained sectors with eutrophication.

Linking Agricultural Activities to Management of Protected Areas

Sustainable agricultural practices and policies can often be used to reduce pressure on Africa's national parks and protected areas. Project planners should identify opportunities to link agricultural interventions and policies to protected areas and associated rural communities. For example, it may be possible to locate on-farm agricultural demonstrations, credit incentives, or road improvement activities in villages near protected areas.

Causes of Negative Environmental Impacts

Agricultural productivity and environment are integrally linked. Pressure on marginal lands from unsustainable agricultural practices can lead to environmental degradation. Increasing the agricultural productivity of lands already under cultivation through the use of sustainable practices can reduce environmental degradation while increasing food security. Despite the appeal of such practices, social, economic, and institutional factors make it difficult for many African farmers to use these practices. For example, uncertain land tenure alters traditional land management systems and centralization of political power, and this has eroded the capacity of local communities to manage their resources sustainably.

Improper use of agricultural pesticides threatens the health of humans and wildlife. Pesticides can become increasingly concentrated and toxic in fish and other animal species relatively high in the food chain. In addition, nitrates from fertilizers increase nutrients in water systems and can result in eutrophication and algal blooms. Excessive enrichment of water resources can reduce the productivity of fisheries, pollute drinking water, and reduce biodiversity.

Irrigation and construction of dams can also have negative environmental effects. Fisheries in rivers and floodplains become vulnerable when large-scale irrigation systems are constructed. Changes in volume and seasonal patterns of water flow and the blockage of fish migration paths can have serious effects, both above and below dams. Absence of seasonal floods and associated replenishment of nutrients in river systems can be as serious a threat as reduction in water flow.

Other potential environmental impacts from dams and irrigation include increased siltation of river channels as a result of soil erosion, spread of waterborne disease, saline intrusion into wetland estuaries, and reduced water flow caused by increased water evaporation from reservoirs and irrigated lands.

Irrigation activities also disturb mangrove and associated fish-breeding habitats. Irrigation can reduce the inflow of fresh water which is necessary to ensure a sufficient supply of nutrients and stability of the substrate into mangrove areas.

Vegetation can also be lost because people living near protected wetlands sometimes pump water illegally from these areas for use in irrigation. Drainage of coastal wetlands for irrigation has also reduced considerably the number of avia species in some African countries.

Key Questions for Soil Resources and Erosion

- Is soil erosion a major obstacle to increased agricultural production or is the problem related to poor soil quality? Are these two problems related?
- Does the site have lateritic (acid and infertile, usually high in iron) or clay soils? Is gully erosion a potential problem? How well drained is the soil?
- What are the social, economic, and physical costs of erosion in the region?
- Would improved tillage practices at the project site better control erosion? If so, what are the obstacles or constraints to changing local practices (e.g., money, labor, traditions, etc.)?
- What are the correlations between geographic variations in soil quality and wealth of the land user (poorer farmers tend to work poorer soils)?
- Are there indications that the site would be susceptible to wind or water erosion (e.g., steep slope or soil high in fine sand and silt content)?
- Are there periods during the year when the soil at the project site is unprotected by vegetative cover and more subject to erosion?
- Will the project cause silt to collect in downstream water bodies, such as streams, lakes, and reservoirs?
- Can the project be designed to include a training course on soil conservation for local participants?
- What other soil management considerations might be part of this particular effort?
- Are there alternative project designs that might minimize soil erosion at the project site?
- Have irrigation and drainage led to leaching of chemicals (e.g., pesticides or fertilizers) into water bodies?

Suggested Actions for Soil Resources

Many techniques can be used to control soil erosion. Planners must decide which ones are most useful for the region, which have been used successfully in previous projects, and which are the most acceptable to local farmers. Some examples of specific mechanical or improved tillage methods include improving soil fertility; timing of field operations; use of plow-plant systems, grassed outlets, and ridge planting; and changes in land use.

These practices are described in Table 3.1, based on material from the U. S. Department of Agriculture (USDA) and the U. S. Environmental Protection Agency (USEPA). The left-hand column gives the name of the practice; the right-hand column describes the advantages and disadvantages of each as an erosion control method and describes the potential effects of such a practice. This presentation makes it possible to view all of these measures as a set of alternatives to be considered during the project planning process.

*Key Questions for Water Resources and Irrigation**

- Community participation is an integral part of any irrigation project if it is to be sustainable:
  - Are the beneficiaries (participants) involved in planning and construction?
  - Have the participants arrived at an equitable system of monitoring the project so that unanticipated impacts can be addressed?
  - Have the participants developed a stable organization that can train, manage, operate and maintain the project?
  - Have participants agreed on an equitable system of allocating water resources?

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* Adapted from Canadian Council for International Cooperation, *Environmental Screening of NGO Development Projects*. 1990.

Table 3.1 Soil and Water Conservation Practices: Advantages and Disadvantages

Practice	Advantages / Disadvantages
No tillage	• Most effective in grass, small grain, and in crop residues • Reduces labor and time required for agriculture • Provides year-round control • Not effective when soil is too hard to allow root development
Conservation tillage	• Includes a variety of no-plow systems to retain residues on surface • More adaptable but less effective than no tillage • Crop residues are often needed for fodder, cooking fuel or building materials
Soil-based rotations	• Good grass cover loses almost no soil and reduces erosion from the next crop • Total soil loss is greatly reduced but unequally distributed over rotation cycle • Aids in plant disease and control of invertebrate pests
Meadowless rotation	• Provides more continuous soil protection than monocrop systems, but less effective than the above • Assists in plant disease and control of invertebrate pests
Water Harvesting	• Micro-catchments (demilunes, pits), check dams, earth stone bunds, tied furrows, and ridges; prevent overland flow, trap soil, increase water infiltration, and enhance crop growth
Improved soil fertility	• Increased organic matter and appropriate fertilization can reduce soil loss as well as increase crop production
Plow-plant system	• Rough, cloddy surface increases infiltration rate and reduces erosion • Seedlings may dry unless moisture is sufficient • Mulch effect is lost by plowing
Contouring	• Can reduce soil loss by up to 50 percent on moderate slopes, less on steep slopes • Must be supported on steep slopes • Must be supported with terraces on long slopes
Graded rows	• Similar to contouring, but less likely to have breaks in rows
Contour strip	• Alternate strips of row crops and hay reduce soil loss to about 50 percent, as compared to contouring only • Area used must be suitable for across-slope farming
Terraces	• Reduces erosion and conserves moisture • Allows more intensive cropping • Some terraces have high initial and maintenance costs • Cannot be used with large farm machinery • Supports contouring and agronomic practices by reducing slope length and runoff concentration
Grassed outlets	• Facilitates draining of graded rows and terrace channels with little erosion • Costly to build and maintain

Table 3.1 Soil and Water Conservation Practices: Advantages and Disadvantages (Continued)

Practice	Advantages / Disadvantages
Vertiver grass strips*	• Planted in narrow (0.5 m) contour hedges, highly effective in erosion control, due to its close, stiff blades, tussock growth habit, and deep and massive root system • Can grow on a wide variety of soil types and at sites where annual rainfall varies from 200 to 6000 mm • Once established, requires little or no maintenance, stays in place for decades, and does not spread into adjacent sites • Inexpensive compared to terracing or bunding, but limited access to planting material may be a constraint • Not suited for temperate conditions
Ridge planting	• Reduces erosion by concentrating runoff in mulch-covered rows • Most effective when rows are cross-slope • Earlier drying and warming of root zones
Contour listing	• Minimizes row breakover • Can reduce yearly soil loss by as much as 50 percent • Same disadvantages as contouring
Change in land use	• In some cases, perhaps the only solution • When other practices fail, may be better to change to permanent grass or forest, as lost land surface can be supplemented by intensive use of less erodable land

* National Research Council, 1993

- Has the following information been gathered in the resources survey?
  - an evaluation of water quality and hydrology, including depth of water table.
  - rainfall data for the area (when and how much).
  - the area to be irrigated (dimensions and topography).
  - soil types and pH.
  - percolation (the rate at which water is absorbed and travels through the soil).
  - the capacity of the soil to retain water.
  - the amount of water needed by crops.
  - the amount of evaporation which will take place.
- Does a new source of water need to be developed or can water requirements be met by improving existing systems of supply?
- Will the project improve irrigation?
- Have water and soil conservation measures been built into the project, including:
  - reducing evaporation and seepage (e.g., by keeping canals narrow and deep, covering canals, pipes where necessary, etc.)?
  - using appropriate techniques (terracing, contour ploughing, mulching) to slow runoff?
  - replanting trees and vegetation of the watershed to improve soil and water retention?
  - education and training for participants to ensure conservation of soil, protection and growth of trees/vegetation?

- appropriate crop selection for soil, water, and climate conditions?
- construction of sand reservoirs in and regions (rather than open reservoirs)?
- agreement on water use rates to avoid overuse?

- In building a drainage system to prevent waterlogged or "salty" soil and assure good crops, have the following factors been considered:
  - depth of crop roots?
  - land contours (topography)?
  - rate of absorption and percolation of soil?
  - the presence of hard or laterite soil layers that can prevent good drainage?
  - existing natural drainage patterns on/below the surface? - natural water table depth during the wet season?
- Has the planning taken into account flood and drought cycles?
- Will water quality be tested to be sure it is good for irrigating crops?
- Are there upstream activities that could affect the amount of water or its quality (e.g., factories, other irrigation, forestry, etc.)?
- If the project will use of fertilizers and pesticides:
  - is there a risk of polluting the water locally or downstream?
  - is there a risk that fish or other life in the water will be poisoned?
  - have all local low-cost alternatives to chemical fertilizers and pesticides been considered?
- If the project involves diverting streams or rivers, will the reduced water flow in the stream:
  - reduce food sources and habitat for aquatic life?
  - reduce food sources for people downstream?
  - prevent or reduce the use of water for irrigation, drinking, livestock, etc., downstream?
  - result in seawater moving up the mouth of the river?
- If ground water is the source of irrigation water, will pumping it result in lowering of the water table?
- If the water table is lowered by pumping, will this affect:
  - other dug and drilled wells in the area?
  - the survival of crops and natural vegetation?
  - the volume of water in streams, rivers, lakes, and woodlands (marshes)?
  - the chances of salt water contaminating freshwater wells?
- Have or will steps be taken to reduce risk of disease from mosquitoes, snails, etc., by:
  - lining canals and ditches?
  - covering or piping water where possible?
  - improving drainage?
  - applying water to avoid pools of standing water for extended periods?
  - keeping canals and ditches free of weeds, sediment and snails?
  - using natural means of disease control (ducks, fish, etc., which eat snails, mosquitoes and flies)?
- Will access to water attract an increased population to the area? If so:
  - can the water supply support the increased demand?
  - will there be increased pressure on other local resources (housing, schools, health care)?
  - will there be increased pressure on local natural resources (trees, grazing land, soils, etc.)?
  - have the politics of water user rights and priorities been addressed?

These are questions that can be asked of any irrigation project. They are not the only ones which can or should be asked. After asking them, the people in the project must decide what can be done about any negative impacts, either to eliminate them or reduce them.

Suggested Actions for Water Resources

Most methods to avoid negative effects of irrigation on human health involve changing human behavior. People living near water canals draw water from uncontaminated canal sections. Using proper methods to dispose of sewage can also reduce the spread of disease. More research on the natural enemies of snails and mosquitoes can identify potential predators such as ducks and geese.

Products from local plants, such as the soapberry (known as the dedecandra plant in Ethiopia) can also serve as molluscicides. The best method by which to reduce the incidence of disease vectors is to implement practices that deprive the vectors of suitable breeding habitat (e.g., conveying water in pipes and tile aqueducts or using buried tiles to drain excess water from fields).

On a smaller scale, the use of enclosed systems for irrigation will not only protect humans from disease but will also prevent seepage and evaporation of irrigation water. Closed systems can also prevent the spread of pesticides outside the intended area. Pesticide use must be monitored carefully to prevent migration downstream from the irrigated area. Unless properly managed, pesticides can alter an ecosystem's structure and function, destroy aquatic life, and cause serious health problems.

Key Questions for Nutrient Runoff

- Is manure available and used as a fertilizer in the project? Could the use of manure result in the spread of disease through human contact? Is care being taken to avoid the spread of plant disease from these residues?
- Will the project involve the use of inorganic fertilizers?
- Could this practice lead to nitrite or ammonia toxicity to humans or animals?
- Will precautions be taken to avoid overfertilization (overfertilization can have negative impacts on plants and soil organisms and cause changes in soil pH levels)?
- Could the project result in the transport of nutrients off-site via runoff, erosion, or leaching?
- Could nutrient transport cause algal blooms, growth of aquatic weeds, and, ultimately, oxygen depletion in water bodies?
- Is the project's success highly dependent on inorganic fertilizers? If so, do farmers have a reliable source?
- Are appropriate management techniques incorporated into the project design to minimize nutrient losses? Are there other nutrient management considerations?
- What alternative project designs could be used at the site to minimize nutrient loss?

Suggested Actions for Nutrient Runoff

Table 3.2 provides information regarding preferred methods for the management of nutrients in agricultural projects. The left-hand column names the practice; the right-hand column describes the advantages, disadvantages, and potential effects of each as a method for controlling nutrients.

Key Questions for Introducing New Species

- Will the project introduce new plant species or varieties? If so, this could have long-term environmental repercussions (e.g., an exotic species could out-compete native species or displace traditional varieties or land races).
- Do new crop varieties require more fertilizer than do traditional food crops?
- Will new crop varieties require greater pesticide use or the use of heavy farm machinery that could lead to other problems?
- Could new pest species be introduced into region along with new food crops?
- Are the new varieties resistant to local pests and weather conditions, like drought?

Table 3.2 Control of Nutrient Loses

Practice	Advantages / Disadvantages
Timed application of nitrogen	• Reduces nitrate leaching • Increases efficiency of nitrogen use
Crop rotation	• Reduces nutrient input needs • Reduces erosion • Reduces pesticide use
Eliminating excessive fertilizer	• Reduces fertilizer cost • Can reduce nitrate leaching
Using animal wastes	• Enables slow release of nutrients • Economic gain for small-scale farmers • Improves soil structure and fertility • Can cause health problems (diseases)
Plowing under green manure crops	• Reduces use of nitrogen fertilizer • Difficult to measure amount of nitrogen input of green manure • Ties up available land
Fertilizer control	• May decrease nitrate leaching • Reduce risk of soil acidification, alkalinization, or salinization
Incorporating surface applications	• Decreases nutrient runoff • No effect on yields
Timed use of fertilizer	• Reduces erosion and nutrient plow-down loss • May not be convenient

Key Questions for Clearing Vegetative Cover

- Has agriculture caused clearing of natural vegetation? If so, to what extent? To what extent has clearing resulted in wind and/or water erosion?
- Has the clearing of vegetation favored one tree species over another? (Throughout Africa, farmers often leave standing those trees that enhance agricultural production or have medicinal uses.)
- What effects has clearing vegetation had on biodiversity and wildlife habitats?

These and other soil and plant cover management practices are described in Table 3.1.

Box 3.1 Fertilizer and the Environment

Fertilizer use maybe "excessive" in certain developed countries, and this problem could be corrected through changes in prices.

In developing countries, in contrast, pockets of excessive fertilizer use are few. Even in those pockets, however, adverse environmental effects are commonly due to deficiencies of micronutrients or trace elements in soils and flawed fertilizer practices, such as imbalance among nutrients and unscientific methods and timing of application. An effective solution for these problems lies not so much in price policy reforms as in enhanced, location-specific research and extension efforts, as well as in improvements in the capabilities of fertilizer supply and distribution systems.

To argue against growth of fertilizer use in developing countries by pointing to its direct adverse environmental impacts in developed countries is both hasty and shortsighted. In fact, some of the above considerations suggest that the positive contributions of chemical fertilizer in arresting environmental degradation could be greater than its direct negative effects. Fertilizer could also be an important tool in combating soil erosion and deforestation, the two dominant elements in environmental degradation.

Source: Desai 1990.

3.2 TIMBER HARVESTING AND PRODUCTION*

Problem Identification

Forests serve many purposes. They protect soil and watersheds, provide browse materials for domestic animals, and allow the production of nontimber forest products (e.g., tourism revenue, fuelwood, construction materials) and the conservation of biodiversity (e.g., wildlife habitat and genetic resources). Sustainable management of forest resources can be achieved only through careful local, regional, and national land use planning.

"Sustainable forest extraction" has been defined as:

> . . . allowing reentry into a previously logged forest area for a second and successive forest cut to remove a commercial timber crop. Reentry only occurs following such period of time as to allow the forest to recover from the initial felling activity and the remaining tree crop to have moved through two or three ten centimeter diameter classes from an agreed commercial minimum felling limit. The successive felling should not destroy or materially affect forest species composition or distribution as a whole; it being accepted that the first entry removed those commercial trees over-mature or at maturity (Evans 1990).

While unsustainable agricultural practices and associated policies are the leading cause of deforestation in Africa, timber production in natural forests is also a direct and indirect contributor to deforestation.

* Also see section 3.10 Agroforestry.

Recent surveys suggest there are no sustainable forest production systems practiced over large areas of West and Central Africa . Furthermore, most anecdotal reports of sustainable timber management systems lack credible support (World Resources Institute 1993).

Potential Environmental Impacts

The unsustainable removal of trees from natural forests reduces soil productivity (e.g., because of increased soil erosion and compaction), lessens forest regeneration, and increases the siltation of water resources. The loss of forest cover due to timber production can destroy or disrupt wildlife habitat and biological diversity. For example, selective or clear-cut timber production can result in the accumulation of wood residues on the forest floor. These wood residues, if not removed, discourage natural regeneration, making artificial regeneration more difficult.

Removal of substantial numbers of a single commercial tree species from a forest can affect the long-term genetic viability of local populations of this species (Sharma 1992). It is often difficult to prevent detrimental genetic changes in forest resources, however, because information may not be available locally or nationally regarding the true populations of specific tree species.

There are also environmental impacts associated with pollution from timber production and processing. Some sources of pollution associated with these activities are organic wastes and residual wood-processing chemicals used for protection against decay organisms.

Various negative social and economic impacts are associated with unsustainable timber production. Forest values related to tourism, local community use (e.g., for medicinal plants or fuelwood), and watershed protection are often inadequately addressed in standard environmental or cost-benefit analyses. Planning for forest production should include an assessment of the true physical, social, and economic value of forest resources.

Effective strategies are needed to maintain a balance among timber production, conservation, and forest regeneration. Land-use planning, forest policy development, and sustainable timber- production techniques and monitoring systems are some of the tools that must be used in sustainable timber production.

Causes of Negative Environmental Impacts

Complexity of the Forest Ecosystem

Africa's tropical forest ecosystem is often complex. For example, more than 300 tree species may be identified in one hectare of some forests (Serageldin 1993). Sustainable timber production requires extensive knowledge of the ecosystem and the potential environmental effects of specific timber operations. Without this knowledge, it is difficult to determine what environmental effects production practices are having on a forest's long-term regeneration and structure.

Inappropriate Production Methods

Use of heavy equipment, absence of environmentally sound production techniques, and poor production planning can have severe consequences. For example, dozens of lesser-known tree species are often felled for every commercial tree harvested in a tropical forest. The use of heavy equipment in timber production can also cause soil erosion and compaction. Soil compaction, in particular, often reduces rates of natural regeneration.

Road building or improvement as part of timber production often provides agriculturalists increased access to forest areas, which can result in an increase in shifting cultivation. Deforestation rates are estimated to be eight times greater in logged-over, closed tropical forests than in undisturbed closed forests (World Resources Institute 1993).

Opportunities should be explored for the use of low-impact production methods. Cutting vines that are connected to a number of individual tree harvest operations can reduce damage to nontarget trees.

Other forest protection measures include felling trees upslope on hillsides and from other trees. Uncontrolled tree felling on hillsides often results in an increase in damaged trees and soil erosion caused by skidding of trees downhill.

Pest Management

Plant protection measures are often needed in forest production activities, especially in tree nurseries. For example, termites are a common problem in community forests in Africa. Effective management of pests does not always require the use of pesticides. Physical barriers, repellents, and good sanitation can often avoid or mitigate pest problems. To the extent pesticides do need to be invoked, refer to Appendix C, Safe Pesticide Use Guidelines.

Government Policies that Encourage Long-Term Investment

Governments own or control nearly 80 percent of tropical forests worldwide. For this reason, government policies for planning and implementing production activities carry great influence (World Resources Institute 1993).

Governments control timber production through timber concessions, which are lease agreements between a government and concessionaires, usually private companies. The concession gives a company the right to fell and market the timber from a given area. The area's size varies by concession, and terms often range from 10 to 30 years. Government taxation systems are used to collect fees from the concessionaires, a portion of which may go to local councils. The bulk, however, goes to the central government and associated government institutions.

Taxes are levied following removal of logs from the forest, but processed logs may be exempted from taxation as an incentive for concessionaires to process timber locally. Levies on export logs may also be lower than those on logs sold locally. Tree species of secondary importance may be taxed less than tree species with high export value.

Government policies often do not encourage concessionaires to manage forests for the long term. African governments have tended to undervalue their indigenous forest resources by charging low stumpage and export taxes. The standard system of national income accounts and economic performance does not reflect the environmental costs of resource depletion and ecosystem damage.

Some consequences of shortsighted government policies follow:

- Short-term forest concessions discourage long-term investment by the private sector.
- Forest concessionaires may not be required to develop long-term forest management plans containing information on the forest resource and production practices and monitoring.
- The concessionaire is often not required to replant a production area or to encourage natural regeneration.
- Concessionaires are often not required to protect the remaining forest from migrating farmers. As mentioned above, unsustainable agricultural practices are the leading cause of deforestation in Africa.

Absence of Community Participation

Local communities, often unaware of the environmental importance of tropical forests, generally do not participate in their sustainable management. In some cases, local communities have sold trees to help convert forest land to agricultural use (Serageldin 1993).

Partnerships need to be developed between forest managers and local communities to address this problem. There may be opportunities to change community behavior regarding forest resources by providing tangible benefits from conservation, including technical assistance, forest-related employment, or continued provision of nontimber products.

Key Questions for Timber Production

- What are opportunities and constraints associated with timber production in Africa? Are there opportunities for timber production on private lands and in secondary forests?
- What are the opportunities for the marketing and use of lesser-known tree species? (Less than 10 percent of Africa's forest tree species are presently being exported and used in the international timber markets.)
- How can NGOs work with the private sector to make better use of wood residues associated with milling operations for particle board and medium-density fiberboard?
- What policies and financial assistance are necessary to encourage private companies and NGOs to invest in improved machinery?
- What types of timber production are most effective in Africa? How can partnerships be established among the timber industry, NGOs, and local communities for the use of low-impact production methods? What role does land tenure play in this process?
- How can the negative environmental impacts associated with timber production best be mitigated and monitored?

Suggested Actions for Timber Production

Improve Efficiency of Timber Processing Capability

As much as 75 percent of each African tree felled is wasted (World Bank 1992). The private sector needs encouragement to invest in modern processing equipment that utilizes harvesting scraps and timbermill wood residues. Such improved efficiency could reduce waste and increase sector revenues.

Reform Timber Production Legislation and Policies

NGOs and international donors need to identify and support legislation and policies that encourage sustainable production. For example, opportunities should be explored to improve forest inventory and management plans, lengthen the duration of production concessions to encourage long-term investments, and adjust wood prices to reflect the true value of timber resources and the opportunity costs associated with their conservation.

Conduct Regional Assessments

Examine pilot projects and concession policies that have resulted in sustainable production activities with community participation. Use these pilot projects as a basis for the design of other sustainable operations.

Develop Markets for Lesser-Known Timber Species

NGOs should evaluate the results of research on the timber potentials of lesser-known tree species and should promote marketing of these for export. As consumers become more aware of forest conservation issues, architectural companies in developed countries are showing increasing interest in the use of lesser-known and less-threatened tree species (Tropical Forestry Foundation 1994).

Assess Soil and Water Conditions

Care must be taken to locate production activities on suitable sites. Production on inappropriate terrain too steep or too dry can lead to severe environmental consequences.

Access Cost-Effective and Environmentally Sound Forest Production Methods

Harvesting systems that closely imitate the natural forest ecosystem tend to have the least negative environmental impacts. For example, selective cutting systems can serve to mimic natural tree falls in the forest. Under such systems, tree selection, directional felling and the cutting of branches are performed in a manner that minimizes the loss of structural diversity. Similarly, shelterwood harvesting systems, which cut strips through a forest, can be designed to mimic extensive windthrow in forests.

The cleared strips are narrow enough to encourage the regeneration of forest tree species (Biodiversity Support Program 1993).

Implement Multiple-Use Forest Management

Multiple-use management should be considered in the design of production projects. For example, there may be opportunities to combine production with tree plantations, agriculture, domestic animal grazing, or wildlife management. Tree plantations and animal grazing can often be managed together. Grazing can be restricted during harvesting operations and resumed once reforested trees have matured. Carefully planned production operations can encourage forest environments that are favorable to specific wildlife species.

Develop a Management Plan

A management plan appropriate to the anticipated scale and intensity of the operations should be developed and updated regularly. Long-term management objectives, and the means of achieving them, should be stated clearly. Methods for selecting forest-harvesting techniques and identifying biologically important forest areas should be identified. Forest regeneration strategies and associated costs should also be identified clearly in the plan.

Establish Sustainable Management Guidelines

- Establish a permanent forest estate for production within the context of a regional land-use plan.
- Physically delineate forests allocated for production.
- Respect the country's forest management laws and the international treaties and agreements to which it is a signatory.
- Define, document, and legally establish long-term tenure and use rights to the land and forest resources.
- Recognize and respect the legal and customary rights of indigenous peoples to own, use, and manage their lands, territories, and resources.
- Maintain the long-term social and economic well-being of forest workers and local communities.
- Encourage the efficient use of the forest's multiple products and services to ensure economic viability and a wide range of environmental and social benefits.
- Conserve biological diversity and its associated values, water resources, soils, and unique and fragile ecosystems and landscapes; maintain the forest's ecological functions and integrity.
- Conduct monitoring appropriate to the scale and intensity of forest management; assess the condition of the forest, yields of forest products, chain of custody, management activities, and social and environmental effects.
- Conserve primary forests, well-developed secondary forests, and sites of major environmental, social, or cultural significance.
- Use tree plantations to complement, not replace, natural forests.

Mitigate Potential Impacts

Appropriate mitigation measures should be developed for each phase of the operation. For example, new or existing access roads and trails should conform to sound environmental design standards. These standards should include requirements for road surveys, road-grade slope, proper surfacing, and mitigation of water runoff.

Reform Forestry Concessions

Forestry departments should reorganize their forest concession systems to provide incentives and regulations encouraging concessionaires to practice forest

management instead of exploitation. NGOs can assist in this process by participating in NEAPs or other educational or consensus-building arenas. Forestry concessions should maintain a management plan (including a forest production plan) specifying short- and long-term management activities and how these complement local and national land-use plans. They should also maintain a detailed inventory of forest tree-species composition needed to supply the sawmill and conservation interventions, topography maps for planning road construction, and an independent monitoring program to be awarded through a competitive process. Also needed are information on potential environmental impacts and associated mitigation measures, a community participation plan that identifies how local resource users will share in the responsibilities and sustainable benefits associated with forest management (e.g., employment, revenue sharing, and training), and a forest reclamation plan (e.g., reforestation or population migration control).

Assess Value of Forest Resources

Revenue systems should be revised so that the amount of tax collected from concessionaires is high enough to reflect the true value of the forest resources removed.

Lengthen Concession Contracts

Secure tenancy should be established for concessionaires to encourage investment in efficient equipment and the use of better management and utilization methods. Under present systems, the concession period is usually too short for concessionaires to invest resources in sustainable extraction methods.

Provide Training

Forestry department staff should be trained to assess forest resources and monitor concessionaire activities. For example, the standard of forest mapping and concessionaire monitoring requirements in some African counties is currently inadequate.

Conduct Forest Assessments and Establish Pilot Projects

Field assessments should identify promising sustainable timber techniques. Using this information as a baseline, pilot projects should be established with NGOs to develop efficient production practices that are compatible with complex forest ecosystems and the requirements of local communities.

Establish Community Partnerships

Partnerships should be established among rural communities, NGOs, and forest concessionaires. Appropriate policies may provide opportunities to generate income for all parties, in addition to establishing sustainable production systems.

Provide Private-Sector Incentives

Opportunities to promote private investments in broad-based forest management should be identified. Reductions in export taxes and offers of easy credit could be incentives for processing companies to use tree plantations instead of natural forests.

The above guidelines should be applied within the political and institutional context of each country or region. A country- and/or region-specific study should be conducted to take into account forest resources, as well as political, administrative, technical, socioeconomic, and financial factors.

The international community should work with host-country governments to manage forests in the best interests of the country's population and national economy. African governments and resource users can need time and incentives before sustainable management systems can be fully developed.

These guidelines are consistent with the International Tropical Timber Organization's target of producing tropical timber from sustainably managed forests by 2000. They are also consistent with the philosophies of the African Timber Organization, the Forest Stewardship Council, and the World Conservation Union.

3.3 LIVESTOCK AND RANGE MANAGEMENT

Problem Identification

Livestock management is an important component of land-use management in many rural communities in sub-Saharan Africa. Range is a land type with multiple functions, including wildlife habitat and fuelwood source. Livestock can be a significant threat to rangeland, however, in that they can degrade vegetation, soil, and water resources if not managed properly. Unsustainable management of livestock is intensified in geographical areas that have dense human populations or disincentives for sustainable resource management.

Potential Environmental Impacts

Improperly managed, livestock can create serious environmental problems, including destruction of agricultural crops; loss of vegetation, stripping trees of bark and the destruction of tree seedlings; overgrazing leading to increased soil erosion and pollution of water resources. Improper manure management can cause problems with odors, sanitation and increased fly populations. Wildlife populations can also be affected by livestock management practices such as fencing and decimated by diseases introduced by livestock.

Causes of Negative Environmental Impacts

In some regions of sub-Saharan Africa (e.g., arid and semiarid tropics), the pressures of population growth and overgrazing are contributing to deforestation, soil erosion, and decreased productivity of marginal lands. One result is that the rural poor are susceptible to drought and other natural disasters. Policies that do not promote sustainable management of livestock can also be the root cause of negative environmental impacts associated with livestock.

Use of new livestock breeds can also have the potential for causing negative environmental impacts. Introduction of a new breed into an area should be approached with caution, since it brings with it the possibility of introducing new diseases that can decimate local livestock herds and wildlife. In addition, the foraging habits of a new breed may lead to a sharp decline in available forage and biodiversity. A new breed's reproductive habits can cause a herd's uncontrolled growth. Weeds can also be accidentally introduced along with new animal species, which may interfere with growth of desirable vegetation.

Key Questions for Livestock and Range Management

- What are the area's present uses and land tenure arrangements and how would livestock management complement or conflict with these uses (e.g., livestock herders are often in conflict with resident farmers, particularly under drought conditions)?
- Will development activities lead to disruption of existing communal management arrangements?
- Would sinking of a new water borehole or other development activities in the area cause a change in herding patterns that, in turn, could result in increased vegetation loss or soil compaction?
- What type of livestock can be raised under local conditions?
- Which breeds are most common in the area? What are their feeding preferences? Do they compete for the same resources? Could they satisfy the project's needs?
- If new livestock breeds are being considered, will they be consistent with the interests of local resource users? How would these seeds fit into local herding systems? Would the livestock adjust easily to new environmental conditions?
- Which wild and domestic species are already present in the area and in what numbers? Have domestic or wild populations undergone significant change recently?

- What are the dangers associated with the introduction of a new breed?
- What practices do a family or community use to control the size and composition of livestock herds?
- How will livestock managers control livestock movement? Will fences be used? If so, will they interfere with wildlife migration? Will the fences be built with local materials?
- Who are the local community's livestock managers?
- How much time do livestock managers spend on animal care? Are they willing to increase time spent on daily care of animals?
- Who is engaged in the marketing of livestock and livestock products?
- Are local livestock managers interested in learning new methods, or do they prefer current methods? (With proper incentives, managers may be interested in experimenting with new methods.)
- Is the demand for livestock products from local or outside populations?
- Will new technologies for preparing livestock products reduce demands on the environment, open additional markets to increase income, or improve health and nutrition of livestock or the community?
- Will livestock and associated animals (dogs) pose a potential threat of disease transmission to wildlife? Is there a vaccination/animal disease control program available?

Actions Suggested for Livestock and Range Management

Assess Present Livestock Use

In order to minimize adverse environmental impacts, livestock planners should analyze the characteristics of animal species and how each fits into local farming systems and traditions. Animals are often valued most for uses other than the production of meat, milk, or eggs. For example, livestock provide power, produce manure for fertilizer, and can be sold or traded in the marketplace. Within various social systems, animals can also serve a variety of cultural purposes, such as gift to resolve conflicts or cement a marriage or other alliance.

Assess Costs and Benefits Associated with New Livestock Breeds

It is important to assess the costs and benefits of a given livestock species for a particular environment. For example, large animals roam over extensive areas in search of food and often require a greater financial investment, can be more difficult to control, and have lower reproductive potential than do small animals. It is important not to underestimate the value of breeds that are well-adapted to the environment.

Rotate Livestock

To maximize forage productivity, it is best to combine or alternate various livestock breeds on a range. Their differing food preferences can help to keep plants productive by minimizing overgrazing of a particular favored area and allowing maturation of neglected plant species. It is prudent to make superior forage available to those animals with the highest needs. When forage is limited, livestock managers may decide that young and milk-producing animals must have first access to new pastures and ranges with a wide variety of abundant forage.

Managers should investigate the value of various rotational systems. By rotating livestock, land can be grazed continuously throughout the year. To prevent disease buildup and to vary grazing pressures, livestock can be rotated between fields or ranges. They can be relocated through either fencing or herding into croplands to consume crop residues.

Determine the Necessary Balance between Livestock

Browsing animals, such as goats and camels, prefer the leafy tops of shrubs. These animals are relatively

insusceptible to infection by parasites found on heavily grazed grasslands. By contrast, grazers tend to consume ground-level grasses and leafy plants. Although grazers also prefer the leafy tops of new growth, on poor pasture they will graze mature stands.

A poor balance between browsers and grazers can lead to a detrimental change in forage mix. For example, too many grazers can diminish the number and populations of herbaceous plant species and allow woody plants to become dominant. A balanced mix of browsers and grazers helps to maintain a diversity of plant species and spread forage pressure more evenly. A balanced grazing system also increases overall range productivity.

Prevent Soil Erosion and Loss of Soil Fertility

Overgrazing can lead to soil erosion and decrease soil fertility through a reduction in the density of vegetation and associated organic matter. Overgrazed soils are also more prone to water and wind erosion.

Poor timing of rangeland use can also contribute to soil erosion. Dry-season grazing can benefit the terrain by breaking up crusted soil and working seeds into the ground. Nonetheless, considerable soil compaction can result when herds graze on moist soil. Soil compaction reduces the ability of soil to absorb moisture and can result in increased erosion from water runoff during the rainy season.

Use Caution When Introducing Improved Forage Plant Species

Livestock tend to overgraze favored areas and plants and neglect others. As unforaged plants mature, they tend to lose vigor and nutritional value. In some cases, native plants can not survive heavy grazing. The introduction of new plant species (accidentally or intentionally) may quickly result in replacement of native plants. Even when grazing pressure is reduced, exotic plant species sometimes retain their dominance.

Assess Land and Water Ownership Patterns

Planners should investigate how changes in ownership might affect forage use. For example, the control of water on critical grazing lands in dry areas by individuals might be a traditional method of limiting livestock populations and preventing herds from exceeding forage availability. The provision of a public well may therefore interfere with the local livestock management system and increase a herd's size beyond its carrying capacity.

Prevent Pollution from Livestock Manure

Animal waste can maintain soil fertility and replenish soil nutrients if collected. Otherwise, uncontrolled manure can be a water pollutant and health hazard for both humans and other animals. For example, manure is often a carrier of disease organisms and can contaminate drinking water supplies with nitrates.

Livestock Ectoparasite Management

Bloodsucking ticks and flies transmit several fatal or seriously debilitating diseases to cattle in Africa, such as tick-borne East Coast fever and nagana, transmitted by the tsetse fly. Cattle dipping and area treatment with pesticides are often used to control the carriers of such diseases. Promising alternatives to such diseases are being researched, such as vaccines for the tick-borne diseases and highly effective tsetse traps using baits. To the extent pesticides are being considered as an option, refer to the Safe Pesticide Use Guidelines, Appendix C.

Box 3.2 Senegal: Local Stewardship and Range Management

The Eastern Senegal Livestock Development Project illustrates how a project focused on strengthening local stewardship capacity in natural resource management can lead to more sustainable natural resource management in Africa. The project covered one million hectares of grasslands that were undergoing rapid resource degradation due to excessive grazing, lack of protection, and the disregard of traditional property rights of pastoralists by incoming herders. Traditional authority structures had eroded from years of central government interference, allowing uncontrolled access into a common-property resource management system.

The development project promoted institutional and technical changes that organized settlements into "pastoral units" empowered with their own management committees. With the committees granted long-term management rights, the pastoral units provided clear legal status for groups and their management areas. The government promised to support these groups against outside incursions by non-pastoralists. Wells, veterinary services, and other services were provided to support these new social units in their improved rangeland management. This project illustrates the positive impact that empowered local communities can have. Through the participation of local pastoralists and safeguards that the approach was technically, financially, ecologically, and socially sound, it was able to reduce pressure on tropical grasslands.

Source: Adapted from Brown and Wyckoff-Baird 1992.

3.4 FISHERIES MANAGEMENT

Problem Identification

Industrial expansion and growth of human populations near water resources are causing increasing environmental stress on fisheries and water-related habitats. These changes are resulting in polluted coastal areas, polluted inland water resources, alteration of fragile wetland ecosystems, and contamination of food-fish resources.

The three main environmental challenges associated with the management of natural and artificially managed fish resources are the biological management of fish resources, the allocation of fish resources among competing individuals and social groups, and pollution and conversion of natural habitat to other uses (e.g. agriculture).

Natural Fisheries

Fish are a main source of protein, and fishing is a principal source of employment for many African communities located near oceans, lakes, or rivers. Annual fish catches in Africa have been increasing slowly, but steadily, from 1.3 million tons in the early 1970s to an estimated 1.7 million tons in 1987. Theoretical calculations have estimated a potential annual fish yield of 3.4-3.9 million tons from Africa's inland waters. Unfortunately, much of the unrealized potential is relatively inaccessible and far from markets (e.g. Congo, Zaire, Okavango Delta in Botswana).

Artificial Fisheries: Aquaculture

Aquaculture refers to the artificial production of fish and other living resources in an aquatic environment. Some examples of artificially managed aquatic resources are fish, algae, and crustaceans (e.g., shrimp,

lobster, or crab). Aquaculture is often conducted in rivers, lakes, reservoirs, coastal lagoons, and other inland and coastal waters.

Aquaculture can be an important source of protein. It can assist those living in remote, economically depressed areas to obtain alternative employment opportunities, increase income, and improve nutrition . Rural farmers are often most likely to pursue fish culture on a part-time basis. Opportunities should therefore be examined to integrate aquacultural activities within the context of agriculture and livestock practices.

There is nevertheless often competition between aquaculture and other land and water uses. The construction of aquaculture fish ponds can have profound negative effects on the maintenance of natural aquatic ecosystems.

Potential Environmental Impacts

Natural Fisheries

- Pollution

  Natural fisheries suffer from pollution rather than contribute to it, although there are potential pollution problems associated with fish-processing plants and intensive aquaculture.

- Degradation of Environment

  While not as intensive as large-scale, offshore, industrial fisheries, excessive harvesting of local fisheries can frequently exceed resource carrying-capacity limits. In addition to depletion of fish, fishing can destroy wildlife habitat through land conversion (e.g., dynamiting, use of coral for building, draining wetlands for agriculture, pollution, building, and road construction).

- Displacement of Native Lake Fish Species

  The introduction of the exotic Nile Perch into Lake Kyoga in Uganda has converted a previously productive, multispecies fishery into one based on only three fish species. This has resulted in a long-term drop in overall fish catch. The fisheries of Lake Victoria appear to be following a similar course (FAO 1989). Nile Perch now dominate the catches, while other fish, some of which were endemic to the lake, have been seriously reduced. Although the total catch has increased, local incomes have not. Nile perch are too big and oily for local tastes, although the tourist hotels buy the filets and they have the potential to be exported (DANIDA 1989).

Artificial Fisheries

- Pollution

  Fish-processing plants and intensive aquaculture systems can pollute water resources. Waste from fish processing has a high biological oxygen demand (BOD). Water containing a high level of BOD causes an increase in microorganism activity, which results in a reduced oxygen supply for fish and other organisms and a deterioration in water quality. If managed properly, however, the discharges from artificial fisheries can be used as a food source for livestock or for other uses.

  International development agencies often promote an integrated land-use management approach, but there are potential negative impacts associated with the integration of fish culture and agriculture. Many pesticides used in agricultural production are extremely toxic to fish. Using these pesticides can make integrated fish culture and traditional rice cultivation impossible. Excessive pesticide use threatens all forms of aquaculture (Shumway 1993).

- Environmental Degradation Due to Fish Pond Construction

  Mangroves are being cleared for fuelwood and to make room for more economically valuable activities (e.g., tourist recreation areas). Conflicts can also occur between fisheries and environmental conservation when mangrove and other wetlands are cleared for aquacultural development. While fish pond aquaculture can produce high yields for local consumption or export, potential negative environmental impacts from construction of fish ponds are rarely considered, for example, loss of vegetation from mangrove clearing for fuelwood and reduced productivity of existing fisheries and fish breeding areas.

- Changes in Lake Fish Species Composition

  Improperly sited aquacultural projects can damage freshwater ecosystems and result in the release of cultured fish stocks into natural freshwater ecosystems. Cultured fish stocks can affect the gene pools of native fish and spread disease among them.

Causes of Negative Environmental Impacts

Natural Fisheries

One of the most important causes of negative impacts on natural fisheries is the increase in human population. Forty percent of the world's population lives in cities, towns, and villages along coasts. This increase also pressures inland water resources and associated natural resources.

Coastal resources play a critical role in the life cycle of many economically important fish species, including breeding, nursery, and feeding grounds. Mangrove areas and coral reefs are particularly important. They provide natural protection to the coastline. Unsustainable management of coastal resources can have adverse effects on aquatic species upon which fish rely.

Fisheries must now often compete with recreation and tourist facilities for limited water resources, and these resources are further threatened by dumping of municipal sewage and industrial wastes. Although proper land-use planning could help to alleviate land-use conflicts, it is rarely conducted.

Managed Artificial Fisheries

Conflicts can occur between fisheries and environmental conservation when wetlands are cleared for aquaculture. For example, the clearing of mangroves or other wetlands to establish fish ponds for shrimp culture can contribute to a decline in natural fisheries. The extensive use of wood from mangroves to smoke fish can also reduce the productivity of fisheries: the smoking of one kilogram of fresh fish consumes approximately 2.5 kilograms of mangrove wood.

Economic analyses of aquacultural projects often neglect the environmental costs associated with construction of fish ponds. While the potential economic returns from managed artificial fisheries may be encouraging, it is important for resource planners to consider the potential long-term reductions in income that may be associated with the activity.

Key Questions for Fisheries Management

Natural Fisheries

- Is the present and potential productivity of fisheries known? How reliable are estimates of productivity? What groups of fisherfolk are currently exploiting the resource? How do current catches compare with the estimated potential?
- What institutions are available to monitor the resources? Are the socioeconomic conditions in the area being monitored? Are existing legal, regulatory, and enforcement institutions capable of managing the additional fish catch?
- Which economic classes of people will ben-

efit from the proposed intervention or policy? Will the benefits of the proposed activity be broad-based?

- If local resource users are to be trained under the program, how can the increase in revenue generated by trained individuals be managed to benefit the entire community sustainably?
- If there has been a depletion in fish resources, was this caused by pollution, dam building, or biological changes in the ecosystem?
- If more modern equipment (e.g., outboard motors) is to be provided to fisherfolk, will this improvement increase the catch sufficiently to compensate resource users for increased maintenance and other costs? Will the improvement lead to unsustainable fish harvesting? Can the market absorb a larger fish catch?
- Can fisheries output be increased without increasing pressure on the resource base (e.g., through reducing post-harvest losses)? Do existing policies encourage unsustainable use of fish resources?

Artificial Fisheries

- How will the aquaculture project affect natural fisheries and wetland resources, including mangroves?
- Can aquaculture products be marketed effectively? How will the products affect resource users in the natural fisheries industry?
- What opportunities and constraints are associated with integrating aquaculture with other resource activities (e.g., agriculture or livestock)?

Suggested Actions for Fisheries Management

- *Use Integrated Land Use Planning*. Sector strategies should be based on an integrated land use management plan. This plan should include the development of sector studies for the formulation of consistent policies and legislation for the fisheries sector. NGOs should explore opportunities to participate in the planning process.
- *Monitor Impacts*. Monitoring of fisheries activities should be ongoing to determine environmental impacts. An overall regional monitoring program should be established to coordinate multisector activities and lessons learned. NGOs should be responsible for ensuring that their individual monitoring methods are consistent with those of the regional monitoring program.

3.5 ECOTOURISM

Problem Identification

Nature-based tourism, known as ecotourism, involves traveling to relatively undisturbed or uncontaminated natural areas to study, admire, and enjoy the scenery and its wild plants and animals as well as any existing cultural manifestations (both past and present) found in these areas. Ecotourism, advances conservation and sustainable development efforts (Boo 1990).

Ecotourism can contribute to economic development and the conservation of protected areas. Little information is available, however, on the environmental impacts of tourism interventions and associated policies on protected areas and local communities. In order to prevent major negative impacts to protected areas and local economies, ecotourism should be developed to balance ecological, social, and economic objectives (International Resources Group 1992).

Potential Environmental Impacts

"Carrying capacity" is a term often used during the evaluation of potential impacts from tourism on protected areas. It is broadly defined as the maximum level of visitor use an area can accommodate with high levels of satisfaction for visitors and few negative impacts, ecological or aesthetic, on resources.

Some examples of potential negative ecological impacts from tourism include deforestation from firewood use or off-trail activities, changes in animal behavior, soil erosion resulting from poorly planned infrastructure or excessive use (e.g., roads, trails, camping areas, and tour boat routes), and pollution (e.g., contamination of water resources, litter, or vehicle and boat exhaust fumes) (Booth 1990).

In addition to physical impacts, ecotourism can also have a negative impact on local resource users living adjacent to protected areas. Tourists can have a significant impact on a community's cultural and economic integrity. For example, tourism's seasonal nature can conflict with a community's use of its labor force for the planting or harvesting of crops. The enhanced protection of an already protected area can also conflict with a community's traditional use of the area for nontimber products (e.g., fuelwood, medicinal plants, or game meat).

The potential local benefits of ecotourism can become the source of negative environmental impacts to the protected area. For example, an increase in employment opportunities, road improvement, technical assistance, or health care could stimulate migration of people to the vicinity of the protected area.

Causes of Negative Environmental Impacts

One of the most important causes of negative environmental impacts is poor planning and coordination. Establishment of a national tourism plan is an important first step, and NGOs can play an important role in the plan's development. The national plan should establish regulations as well as policies and responsibilities for tour operators and other resource users. In addition, a management plan should be developed for specific protected areas before the initiation of tourism activities.

Protected-area staff also need training in the management of nature-based tourists. In addition to enhancing the enjoyment and educational experience of the tourist, properly trained staff can ensure that tourists stay within designated areas and use facilities (e.g., water resources, fuelwood, and camping sites) in a sustainable manner.

Key Questions for Ecotourism

- What is the current tourism situation in the area? What is the status of natural resources, tourism demand, and infrastructure?
- What is the most appropriate level of tourism for the area? What is the carrying capacity of the protected area?
- What can be done to achieve the level of tourism desired? What tasks need to be accomplished and what skills are required?

Box 3.3 Suggested Outline for a Tourism Concession Operations Plan

I. Brief Description of Concession Size and Facilities
II. Visitor Management
  A. Rules and Regulations
    1. Storage areas
    2. Vehicle parking areas
    3. Road use
    4. Beach and boat use
    5. Day use
    6. Length of stay
    7. Number of people
III. Facility Management
  A. Hours of Operation
    1. Yearly
    2. Seasonal
    3. Weekly
    4. Holidays
  B. Reservation and Refund Policy
  C. Services
    1. Scope
    2. Quality
    3. Rates
    4. Public comments
  D. Safety and Sanitation
    1. Inspections by concessionaire
    2. Signs
    3. Garbage
    4. Fire suppression
    5. Accident reporting
IV. Staffing and Employment Practices
  A. Number of employees
  B. Training
V. Public Information
  A. Signs
  B. Literature
  C. Advertising
  D. Guidelines For Tourist Management (e.g., for a Bureau of Land Management or Office of Recreation)

- What kinds of monitoring systems are needed to track environmental impacts associated with tourism?
- Are there opportunities to use local materials, facilities, labor and cultural resources (e.g., housing/interpretive centers, food supplies, transportation, entertainment, handicrafts, tour guides, or canoes)?
- What has been the experience of other nature-based tourism activities within Africa? Were there specific political or policy conditions that influenced these initiatives?

Suggested Actions for Ecotourism

Develop Protected-Area Tourism Plans. Such a plan should be based on appropriate ecological and social field assessments. The ecological assessment should identify sites to be avoided as well those to be developed. For example, there may be a site within the protected area from which a number of wildlife habitats (e.g., savannah-woodland or wetland) can be seen at one time. After considering the potential difficulty in access and distance from the base camp, such an area could be recorded as a potential wildlife viewing area.

A social assessment should provide information on how local community uses the protected area. Local communities in Africa often receive substantial income and materials from forest resources in the form of game meat, fish, medicine, and construction materials. In addition, the social assessment should identify the people who use the protected area and how their activities affect the ecosystem and the present tourist experience. Finally, the social survey should determine if a sustainable partnership could be established between tourism managers and local communities. Once the ecological and social assessments are completed, a tourism plan should be developed to set parameters for infrastructure development (e.g., roads, trails, and camp sites); the number, location, and

intensity of tourist visits; and responsibilities for environmental impact monitoring.

Develop a Tourism Concession Program. A program to regulate tourism concessions should be established for occupancy and development of national lands. These lands are often established for recreation and commercial purposes through a commercial lease. A tourism concession should provide for a fair and stable administrative environment for concessionaires, receipt of fair market value and reimbursement of costs to the national government, public safety and health, and satisfactory tourism facilities and services for the public.

These goals should be monitored through periodic inspections. The information obtained from monitoring should be used as a basis for government to determine whether to continue or terminate a concession. The information should also be used to determine whether a concession should be approved to build or operate additional facilities within current lease boundaries.

A concession application should include specific information regarding the implementation and monitoring of the concession activity. The government, private sector, tour guides/interpretive workers, NGOs, donors, and local communities should agree on information and restrictions to be included in a concession contract.

A concession operating plan and implementation guidelines should be developed to establish standards for concession operations and to reduce visitor impacts. If a protected area has a concession system, requirements can be established through a contract before a tourism business is allowed to operate in the area. Without a concession system, negative impacts from the management of tour operations, lodges and all other private enterprises surrounding the area can best be prevented, by providing guidelines that are as specific as possible.

An effective tourism concession plan should:

- establish the goals and land-use zone restrictions of the protected area (e.g., research areas, tourism areas, and preservation areas);
- develop guidelines for visitor behavior and use (e.g., campgrounds, hiking, and boating); and
- establish official regulations based on the guidelines. (This requires sufficient enforcement and research personnel to make recommendations, supported by data regarding visitor impacts on soils, water, and endangered species and habitat.)

The following are key points to consider when establishing guidelines:

- decide who is the primary audience for the guidelines (e.g., general visitors, tour operators, or user groups);
- identify the theme or key thrust of the guidelines (e.g., environmental protection or increased cultural awareness);
- consult with guides who lead tourists into target areas;
- obtain technical assistance from scientists who have studied tourism's impact;
- organize a meeting or workshop with the parties concerned with tourism development. Form a committee residents, resource managers, guides, commercial operators, lodge owners, service personnel, and local vendors;
- as appropriate, use guidelines from other countries as a model;
- set objectives and formulate a way to evaluate whether the objectives have been met (e.g., a decreased level of animal harassment or trail erosion);
- develop a draft document that can be reviewed by technical specialists; and
- create distribution plan for guidelines.

Once these steps are completed, a standardized tourism concession operations plan can be established for use by private-sector tourism operators.

In addition to guidelines for private-sector concessions, guidelines should be developed for *tourists*,

Table 3.3 Impact Mitigation Matrix for Activities Related to Tourism Development

Sector Activity	Potential Negative Impacts	Causes	Mitigation Measures
Road, campground or other construction	• Loss of vegetation • Soil erosion • Loss of biodiversity • Water resource pollution or siltation • Loss of aesthetic attributes • Physical and social disruption to nearby resource user communities	• Absence of management plan • Inappropriate facility design, tools and training • Absence of monitoring plan and implementation • Policies that promote capital intensive inputs or political preferences	• Survey park to identify ecologically sensitive areas • Survey local communities to identify how resource users use park resources • Develop management plan • Identify appropriate areas for tourism development and use
Unsustainable use of park by tourists	• Loss of vegetation • Soil erosion • Loss of biodiversity • Water pollution or siltation • Loss of aesthetic attributes • Physical and social disruption to nearby communities	• Absence of planning or regulations	• Develop: • licensing program for private concessionaires • implementation plan and guidelines for tourism concessions • regulations and policies to protect environment • safety and service standards for tourists • transparent concessionaire award process • Conduct all planning activities with resource users • Determine needs and interests of resource users • Implement revenue-sharing employment or other activities as appropriate activities with resource users
Unsustainable use of park by local resource users	• Loss of vegetation • Soil erosion • Loss of biodiversity • Water pollution or siltation • Loss of aesthetic attributes	• Absence of participation by resource users in park demarcation and planning • Resource users receive insufficient tangible benefits from park (e.g., income, health, education) • Ineffective enforcement of regulations and resource user agreements	

who need and usually appreciate information on how to behave. Much of the environmental and cultural damage that tourists cause results from lack of information and understanding.

3.6 SMALL-SCALE RURAL ENTERPRISES

Problem Identification

Small-scale enterprises are resource-user level, income-generating activities that often require limited capital investment. Examples include fish culture, beekeeping, collection of medicinal herbs, small-animal husbandry, fruit production, vegetable production, and production of tourist handicrafts.

Employment and income from small-scale, nonfarm enterprise activities make them the second-largest industry in Africa after agriculture (Page and Steel 1984). Rural, nonfarm work provides 20 to 45 percent of full-time employment in rural areas and 30 to 50 percent of total rural household income (Arnold 1994).

Natural forests, in particular, provide many important products. Nontimber forest products include fuelwood, rope, bamboo, cork, gums, medicine, and game meat. Forests also provide the raw materials for many small-scale rural processing and manufacturing enterprises. Some examples include wood resources used for furniture, implement-making, and charcoal production; cane and reeds used for baskets, mats, and handicrafts; nuts and seeds used for oil processing; bark for tannin processing; and fish ponds.

In addition to forest products for trade and construction, people use environmental resources as a source of medicine. For example, approximately 70 percent of Africans rely on herbal medicines. In addition to medicines used by specialist healers, common plant treatments are known and used by the majority of people.

Small-scale enterprises contribute to economic development in both the international and local markets. In addition, forest-based enterprises are contributing to the alleviation of poverty in rural communities.

Potential Environmental Impacts

If properly designed and monitored, small-scale, rural development activities can be implemented without significant negative environmental impacts. Small-scale enterprises are often a component of conservation and development projects, which are based on the assumption that providing resource users with economic benefits will encourage them to use more sustainable practices within the protected area.

Despite the appeal of such activities, the improvement of living conditions (e.g., transportation, health, and education) near a protected area can attract people from other regions, which then increases pressure on the protected areas, both directly and indirectly. An increase in population beyond an area's carrying capacity could result in deforestation, soil erosion, or other physical degradation. The indirect impacts of an increased population could include added stress on traditional institutions (e.g., land-tenure systems, market access, and health).

Key Questions for Small-Scale Enterprises

- What are the environmental opportunities and constraints associated with the proposed project?
- What are the policy conditions required to enable local resource users to participate in the activity to use the resource sustainably?

- What is the project area's present land use and carrying capacity? How does one determine if the land is being exploited beyond its carrying capacity?
- Is information available regarding promising and sustainable small-scale enterprise projects in Africa and elsewhere?
- What are the links between policy reform, small-scale enterprises, and larger, private-sector enterprises?
- What is the relation between small-scale enterprises and other sectors, and how are they linked jointly to the environment (e.g., transportation, agriculture, and education)?

Actions Suggested for Small-Scale Enterprises

Develop a Business Plan.

A simple business plan, such as that described below, can assist in the design of small-scale enterprises. (Please note that some of the sections or questions below may not apply to all small-scale enterprises in Africa.)

Overview of Business

Define the business activity and identify questions to be answered during project design.

- What is the specific product or service, and who will benefit from its use?
- What human resources, skills, capital, information, and materials are needed to obtain or produce the product?
- If the product is to be sold, who are the customers? Why would they buy this product or service?

Market Opportunity

Define what the small-scale enterprise would be doing and who would be buying or using its products.

- What is the history of the market you intend to enter (i.e., experience with demand for commodities, etc.)?
- Would the product be of higher quality than what is offered by others with similar products or services? What are the constraints associated with the production or distribution of this product (e.g., seasonal availability of product, market access, technical skills, or lack of tools or spare parts)?
- What prices would the intended customers be willing to pay? How were the estimated prices determined?

Competition

Define who else is selling similar products or services.

- Who are the competitors for this product or service? Are they selling the same product or a similar one?
- What advantage would the enterprise have over the competition? Would the advantage be sustainable over the long-term?

Cost of Product

Determine the costs for the small-scale enterprise.

- What is cost of goods or services offered?
- What are the production elements that contribute to the cost (e.g., labor, materials, and energy)?
- What are the fixed and recurrent costs associated with the activity (e.g., tools, parts, energy, marketing, and communications)?

- Where will profits go and how will they be managed?
- If the activity is associated with a conservation and development project, what percentage of the profits will benefit the local communities? How will this money be managed and for what purpose?

Address Potential Environmental Impacts

Identify the potential environmental impacts early in the proposal review process to help the financing organization review the proposed project more effectively. One of the most important ingredients required to achieve sustainable resource management is information. A review of this and other sections in these guidelines should assist you in this process; additional information should be obtained as required.

Monitor Use of Resources.

The uncontrolled use of environmental resources associated with a small-scale enterprise activity can lead to environmental degradation. In a forest environment, for example, wildlife play an important role in seed dispersion and predation. Therefore, the over-exploitation of certain wildlife can severely affect the forest ecosystem. Extensive fuelwood harvesting for charcoal production can also lead to degradation.

It can often be easier to monitor and regulate the use of resources indirectly. For example, the monitoring and regulating of transportation and market activities can provide information regarding the increases or decreases in the use of environmental resources. It may also be necessary to monitor ecological conditions and resource users' activities directly as part of a site-specific monitoring program.

Reform Policy Environment.

National governments should establish policies that help people manage forest resources sustainably, particularly during periods of political and institutional change (i.e., periods of national structural adjustment). People at the lowest income level should be the priority target of these reforms. Policy measures that favor large, formal-sector firms could bias competition against small enterprises that produce comparable products (FAO, 1987).

Reform Resource-Use Rights.

Resource-use regulations should distinguish between utilization by local resource users and by larger, commercial enterprises for distant markets. The limitation of local resource users' rights reduces their access to raw materials and can result in illegal use and overexploitation.

Encourage Participation by Indigenous Peoples.

The strengthening of indigenous peoples' ability to sustainably manage resources should be encouraged.

3.7 SMALL INDUSTRY

Problem Identification

Ongoing industrial activities in sub-Saharan Africa are often insufficiently regulated and environmentally unsound. For industrial activities to contribute to broad-based economic development, they must be implemented in a sustainable manner. The goal of industrial growth is no longer sufficient as the sole justification for the construction of an industrial site. The current level of knowledge of public health problems and environmental degradation resulting from poor planning is a compelling reason for a change in thinking.

The sites for industrial facilities have been selected historically on the basis of economic and technical factors: favorable terrain and access to raw materials, energy sources, transportation, and labor. More recently, the sitting of industry has evolved to include considerations of the natural and social environment (e.g., acceptance of the proposed activity by local communities) (World Bank 1991).

Potential Environmental Impacts

Airborne gases, liquids, or solids have the greatest potential for negative environmental impacts of industrial activities. Pollutant discharges from small industry to surface or ground water can cause serious damage to drinking water supplies. Pollutants can be in the form of suspended organic material, chlorinated organic substances, heavy metals, inorganic substances, oils, or tars.

Industrial pollution is a major threat to Africa's coastal waters. More than 90 percent of all chemicals, refuse, and other materials entering coastal waters remain as sediments in wetlands, reefs, and other coastal ecosystems (Shumway 1993). The result can be an increase in fish mortality, reduction in the number of fish safe for export, and reduction in the quality of fish and other species habitats.

Industrial threats to coastal and marine resources include contamination by heavy metals and other chemical effluents from sugar refineries, tanneries, pulp plants, and oil refineries. In addition, plastic and other debris (e.g., fragments of fishing nets) entangle and can kill marine animals.

Certain industrial activities also require significant clearing of vegetation. Industrial mining operations often require extensive removal of forest cover (e.g., of phosphate, iron ore, or diamonds) . The extraction of large quantities of soil as mining overburden may also be required. Ecosystems are often highly sensitive to changes in water quality, soil erosion, and air pollution associated with industrial activities (African Development Bank 1994a).

Ambient noise can also cause disturbances to people living in close proximity to industrial areas. The construction of roads leading to project sites increase noise and dust levels as a result of increased vehicular traffic. There are also occupational health hazards associated with small industrial activities. In addition to medical problems caused by exposure to some chemicals, there are risks associated with explosion.

Causes of Negative Environmental Impacts

Negative environmental impacts from industrial activities often begin with construction of the plant site and access roads. Depending on type and condition of existing roads, it may be necessary to clear portions of forests to provide access to the plant site. Industrial activities also rely on local natural resources for raw materials, energy, and water.

Industrial pollution can directly harm fish and the food chain that supports fish populations. High contents of organic matter, petroleum derivatives, and heavy metals in water lower the level of dissolved oxygen in estuarine waters. This condition can result in a reduction in ecosystem productivity. In addition, hydrocarbons can attach to wetland plants and disrupt the efficiency of plant metabolism.

Key Questions for Small Industry

- Does the host country have environmental assessment policy and guidelines? Who is responsible for assessing the environmental impacts associated with the project?
- What are the links among industrial production, soil erosion, and deforestation?
- Are there opportunities to establish tree plantations for use by industry and rural communities?
- Have there been similar industrial activities in the country or region? If so, what have been the direct and indirect environmental effects?
- What types of roads and other infrastructure are needed in association with the industrial activity?
- What is the structural condition of the nearby forest? Is the forest area already being intensively used by resource users? Is the proposed industrial activity near water resources or protected areas?
- What effects will industrial activity and associated road development have on people in the area, and how will an increase or decrease in their numbers affect the environment?
- Do the indigenous people use the natural resources in the area? How will the industrial activity affect them, positively and negatively?

Suggested Actions for Small Industry

Understand the Land-Use Planning Context. Become familiar with existing publications on the environment and land-use planning in the project area prior to the design of the industrial activity. Conduct an environmental reconnaissance of the area to integrate anticipated environmental monitoring or companion development activities into the initial project design. For example, identify the location of protected areas, water resources, and steep slopes in the project area. Obtain information on the location of rural communities and other rural development activities in the project area.

Develop a Management Plan. Ensure that the management plan addresses the anticipated use of natural resources and potential effects on the environment. Issues to address in the management plan should include:

- description of the size, scale, and location of activities;
- transportation needs and road improvement required;
- raw materials (e.g., wood, potable water, and fuel) and storage facilities required;
- type and extent of polluting discharges;
- assessment of the industrial activity's effects on land-use patterns in the area;
- capacity of the existing community to absorb immigrants attracted to the area;
- proximity and size of commodity markets;
- available energy sources and long-term capacity of supply; and
- availability of potable water and sewage disposal.

Identify Responsibilities. A life-cycle approach should be developed to identify potential pollution and impacts of the activity. Individuals should be identified who will monitor and mitigate potential environmental impacts at each stage of the production process, both in the field and in regulatory institutions.

Select Appropriate Site. An industrial site that does not require extensive removal of vegetation should be selected. Likely sites would be those that have existing roads and have been previously cleared of vegetation for another purpose.

Assess Potential Fuelwood Consumption. The extent to which the industrial activity will use fuelwood

resources, both for production purposes and by laborers working on the site, should be identified. For example, the brick- and bread-making industries use extensive quantities of wood for production. If extensive wood resources are required, the establishment of a tree plantation should be considered as part of the project. Other sources of energy should also be considered.

Assess Potential for Population Changes. Note any anticipated movement of people into the industrial site because of employment or other benefits associated with the activity. Such a migration can create a greater demand for food, housing, and other facilities.

Determine Raw Materials Required. Small-scale industry in a rural setting is usually dependent on the immediate surroundings for raw materials (e.g., clay, stone, and construction wood) and fuelwood resources. Extraction of raw materials required by the industry should be assessed for its direct and indirect environmental impacts.

Handle Toxic Materials Safely. Consideration should be given to the proper transportation and storage of toxic, explosive, and flammable materials.

Develop a Reclamation Plan. The industrial project should have an appropriate reclamation plan that includes reforestation of deforested areas.

Monitor Impacts. A plan should be developed during project design to monitor environmental impacts associated with the industrial activity (e.g., chemical discharges, erosion, or loss of vegetation). Financial resources should be set aside for the monitoring activity early in the project design phase.

Additional approaches are discussed in this chapter in Section 3.15 on waste management.

3.8 RURAL ROADS

Problem Identification

Projects to improve rural roads can have positive and negative effects on the environment and associated rural communities. Environmental considerations can be a problem for project planners if problems are not addressed early in project design. For this reason, every effort should be made to integrate environmentally sound practices into initial project design. These practices include land-use planning, environmental assessment and mitigation, monitoring of impacts, and training.

Potential Environmental Impacts

Proposed road projects should be assessed for both positive and negative environmental impacts. Some of the benefits of improved roads are reduction in transportation costs and improved access to markets, health care services, education, agricultural inputs, and training and extension services.

Improvement of existing rural roads can potentially protect the biological integrity of an area. For example, small bridges in disrepair often force drivers to create alternate routes on either side of a bridge. Deviations from permanent roads often cause more ecological damage than the improvement of existing roads.

Negative environmental effects often result directly from clearing vegetation for road improvement. The magnitude of the impact on vegetation depends on the type and extent of vegetative cover removed.

Indirect, negative environmental effects include road development, which changes the physical environment and often provides people the opportunity to further exploit natural resources (e.g., fuelwood, charcoal production, and agriculture).

Some examples of environmental concerns, including potential social impacts, associated with rural road development are as follows:

- Soil erosion resulting from open borrows, spoil areas, brick quarries, or excess water runoff;

- Impacts on water resources resulting from the establishment of drainage facilities and the impoundment of water;
- Extensive soil erosion and loss of vegetation resulting from the use of large graders and bulldozers as opposed to labor-based techniques;
- Encouragement of higher vehicular speed, which can result in the loss of wildlife at road crossings;
- Increased deforestation from an increase in agricultural and charcoal production;
- Pollution of streams and other water resources by suspended soil particles and other pollutants associated with improvement activities and increased vehicular use;
- Increased demand for manufactured goods and processed foods from other regions due to increases in income and migration of local producers to urban areas because of decreases in income;
- Disruptions in seasonal labor patterns associated with agricultural production as a result of employment of local labor in road improvement projects;
- Increased spread of disease as a result of increased movement of people between areas;
- Potential acceleration of cultural change due to of the migration of people to remote areas via improved roads.

Causes of Negative Environmental Impacts

Soil erosion and consequent water siltation associated with road improvements frequently result from the absence of adequate erosion control measures. By the time ditches and culverts are established, heavy rains have often already eroded exposed soil and produced flooding. Hillside slopes should be stabilized as soon as possible to minimize soil loss from runoff.

Adequate planning and road maintenance can present many problems associated with road improvement. For example, an informal assessment of the project area's soil, vegetation, water resources, and protected areas can flag potential environmental impacts. Armed with this information, project planners can address and integrate environmental mitigation and monitoring measures in the design phase.

Key Questions for Road Improvements

- Does the host country have environmental assessment and resource management policies and guidelines? Which institution is responsible for assessing environmental impacts?
- Has there been successful land-use planning in the past associated with road improvements in environmentally sensitive areas? What "best management practices" and mitigation measures were used?
- What are the direct and indirect effects of improvement activities on the environment and rural communities?
- Does the proposed activity follow an existing route? If not, what type of road will be built, and what types of resources will be directly affected?
- What is the structural condition of the nearby forest? Are resource users already using the forest area intensively for agriculture or other activities?
- How will the activity affect local resource users, positively and negatively?
- Is the proposed activity near water resources or protected areas?
- What effect will the road activity have on the numbers of people in the area, and how will the change in their numbers affect the environment?
- What are the proposed road engineering standards? Will the project make use of heavy equipment or local labor? Will the project include a maintenance component?

Table 3.4 Impact Mitigation Matrix for Activities Related to Rural Road Development

Sector Activity	Potential Negative Impacts	Causes	Mitigation Measures
Road grading, road widening, bridge construction	• Loss of vegetation • Soil erosion • Loss of biodiversity • Water pollution or siltation • Loss of aesthetic attributes • Physical and social disruption to nearby communities • Migration of resource users that can increase charcoal productions, shifting cultivation, disease, etc. • Shortage of agricultural labor resulting from employment with road improvement project	• Absence of adequate erosion control measures • Use of environmentally unsound construction methods • Inappropriate planning and road maintenance • Absence of monitoring plan and implementation	• Conduct survey and planning activities with resource users • Determine needs and interests of resource users • Conduct assessment to identify the location of forests, protected areas, water resources, steep slopes, etc. • Identify best site for road construction activities • Use best management practices: • properly designed culverts, soil erosion prevention, maintain existing water resources and wildlife, stabilize slopes with vegetation • Preserve natural habitat along streams, steep slopes, and ecologically sensitive areas • Reform policies to control human migration to ecologically sensitive areas • Develop monitoring plan and identify financial resources • Develop maintenance and reclamation plans. Restore vegetation and habitat

- By whom and by what means will project activities be monitored?
- What is the area's carrying capacity that will be most affected by road improvement? Will improved access to the area complement the community's goals and other development activities planned for the area?
- Based on preliminary environmental surveys, should companion development activities be integrated into the initial design of the project to mitigate adverse environmental impacts?

Suggested Actions

Understand the Land-Use Planning Context. Become familiar with environmental and land-use planning documents relative to the area prior to the design of the road activity. Conduct an informal environmental assessment of the area for the purpose of integrating anticipated environmental monitoring or companion development activities into the project design. For example, identify the location of protected areas, water resources, and steep slopes in the project area. Also obtain information on the locations of rural communities and other development activities in the project area.

Use Environmentally Sound Road Engineering Practices. To minimize potential environmental impacts associated with road projects, designers should make use of environmentally sound practices. These include ensuring protection against soil erosion from steep slopes and water runoff, establishing culverts and bridges to channel water resources, and using structurally sound, local materials, when possible.

Monitor Impacts. During project design, develop a plan to monitor the direct and indirect impacts of the road activity on forest resources. Financial resources for monitoring should be set aside early in the project design phase.

Develop a Maintenance Plan. Ensure that necessary funding is available for the maintenance of road surfaces, bridges, culverts, and ditches. Include a reclamation plan for reforestation and erosion control, as necessary.

Provide Training. Provide hands-on training to NGO and host-country counterparts for the integration of environmental considerations into road projects. Some pertinent training topics include elements of project design, integrated resource planning and environmental assessment, impacts of road improvement on ecosystems, environmental impact monitoring, and environmental reclamation.

Develop Companion Project Activities (if necessary). Companion activities should be integrated into the project design to decrease negative environmental impacts and to maximize benefits associated with rural road improvement. For example, small farmers in the project area may be unable to capitalize on their new access to markets without some form of initial assistance. Financial assistance could be provided to these farmers for the transport of their commodities.

An environmental impact monitoring system may be an appropriate companion project to monitor positive and negative effects associated with the project. It is important that financial resources be set aside for this purpose early in the project's design, whether or not negative environmental impacts are initially anticipated.

3.9 ENERGY

Problem Identification

Biomass, consisting of forest resources and other organic matter, is the primary source of energy in sub-Saharan Africa. In many African countries, it accounts for 50 to 90 percent of the total national energy supply. Although biomass can be an environmentally sound source of energy, current practices of biomass production and use are often unsustainable and have adverse effects on Africa's environment.

Modern per capita energy consumption has been declining over the past 10 years in sub-Saharan Africa. This downward trend is forecasted to continue as populations increase and rates of electricity generation decline. Although Africa maintains substantial and diverse energy resources, the sources and demand for these resources are spread throughout the continent. For example, 96 percent of oil reserves are located in North Africa, Nigeria, and Angola; 95 percent of the workable coal fields are in southern Africa; and hydroelectric resources are in both East and West Africa.

The heterogeneous nature of Africa's energy resources has not facilitated the transition from biomass to more modern forms of energy for most Africans. More than 60 percent of Africa's total energy still derives from such biomass resources as fuelwood. Africa's reliance on fuelwood as an energy source has often been a barrier to development of private-enterprise initiatives.

Potential Environmental Impacts

In addition to impeding economic development, Africa's reliance on biomass resources for energy is contributing to environmental degradation. Africa's forests have been reduced in area by one-half during this century. While such factors as agricultural expansion and increases in human population are responsible for deforestation in Africa, the unsustainable use of forest resources for fuelwood is a significant cause. In some areas, the continuous loss of vegetation resulting from unsustainable fuelwood use is also having negative impacts on agricultural productivity (e.g., loss of soil from increased erosion) and biodiversity (e.g., loss of genetic material and wildlife habitat).

In addition to environmental impacts, the use of biomass in inefficient stoves in poorly ventilated surroundings exposes users to high levels of air pollution. Continuous exposure can have serious effects on human health, particularly among women and children, who spend much time indoors and are therefore exposed for long periods.

Causes of Negative Environmental Impacts

In Africa, great distances often separate the location of biomass and the consumers. Thirty two percent of the total African population lives in areas where the biomass resource cannot be sustained under present utilization practices. Agricultural expansion is a major cause of deforestation in many parts of Africa, but the demand for fuelwood by urban populations is a major contributor to deforestation in the arid and semiarid region.

Charcoal production also adversely affects the environment. In many parts of Africa, forest resources are being cleared beyond sustainable levels for use as charcoal. Not only does this result in deforestation, but it can cause an increase in soil erosion and a consequent decrease in agricultural productivity. The increasing distance between resource users and the source of fuelwood will also raise the price of charcoal and other sources of energy.

Tree- and land-tenure laws have also discouraged the planting of trees and the sustainable use of fuelwood. In addition, the international community has tended to favor establishing fuelwood tree plantations over sustainably managed natural forests.

Key Questions for Energy Projects

- Are there competing uses for scarce energy resources? Are there alternatives or policy reforms that could reduce the competition?

- Could the establishment of small-scale, local energy projects relieve energy supply shortages?
- Could a small-scale energy project increase local awareness of the benefits of energy conservation and change the behavior of resource users?
- Have local communities been consulted early in the project-identification phase? (They may have suggestions and needs that should be the basis for project development.)
- What are the long-term aspirations of rural communities regarding energy? Will fuelwood accommodate these aspirations? If the community is interested in the development of small industry/enterprise, should other forms of energy be considered?
- Who in the community will participate in the energy project? Does a community organization need to be strengthened for the purpose of project identification and implementation?
- Has the World Bank or another international organization completed an energy-sector analysis been completed for the country by ? What is the current energy-use pattern in the immediate project area?
- What are the opportunities for the energy sector to collaborate with other sectors (e.g., agriculture, forestry, or industry)?
- Who are the project's beneficiaries? Will the project benefit local households or an entire area?
- If it is a fuelwood project, how accessible will the fuelwood produced be to the area where the fuelwood will be consumed? What are the transportation costs related to the project?
- What is the carrying capacity of the environment with respect to the project's sustainability?
- What are the socioeconomic incentives and constraints associated with the project (e.g., tree-tenure systems or credit availability)?

Suggested Actions for Energy Projects

Policy and Institutional Initiatives

Energy should not be viewed as an isolated subsector, but as an essential complementary element of an integrated development process. According to information presented at a UNDP African Energy Experts Meeting in Nairobi, Kenya (1992), innovative policy and institutional options such as the following are needed for the region:

- *Review the Institutional Framework.* The existing institutional framework and opportunities for improved management should be identified. For example, Ghana has established an energy institution outside the civil service structure. Independent institutions should be involved in policy research and project implementation.
- *Formulate Transparent Regulatory and Fiscal Measures.* Monitoring and enforcement measures for energy use should be established. Stakeholder and energy distributors should participate in all agreements and monitoring activities.
- *Create a Favorable Investment Climate*. Pricing schemes to allow full recovery of the costs of energy generation and distribution should be established.
- *Improve Financial Conditions.* Mobilization of local financial resources is a prerequisite for sustainable energy development in a given region. The region's dependence on external funding sources should be reduced. Opportunities should be explored to involve local banks and financial agencies. In addition, financial performance of energy companies should be improved to attract local and external investors.

- *Identify Opportunities to Manage Fuelwood Resources Sustainably*. International organizations have conducted fuelwood initiatives for many years. These initiatives have included large-scale tree plantations, rural afforestation, agroforestry, and natural forest management. In addition, the international community has also conducted activities to reduce demand for fuelwood (e.g., improved biomass stoves for cooking).

Initiatives worldwide have demonstrated the benefits of natural forest management. Such management for fuelwood is superior in economic terms to tree plantations. A common characteristic of promising natural forest management initiatives found in West Africa is that they address community issues (e.g., tree tenure, local governance, and community participation) (USAID 1988).

Fuelwood Initiatives

- *Assess Biomass*. Conduct an analysis to determine the availability of and demand for fuelwood. Remote sensing and modern mapping techniques can be used for this purpose. The assessment should identify patterns of deforestation and provide information on promising energy initiatives in the area.
- *Develop Biomass Strategy*. Develop a biomass strategy based on the assessment. The strategy should identify areas that require technical assistance and policy reforms and indicate where conditions are appropriate for use of energy sources other than fuelwood.
- *Develop Action Plans*. Implement action plans at local and national levels that combine measures aimed at increasing production (e.g., agroforestry), reducing consumption (e.g., improved cooking stoves) and enhancing protection of remaining forest resources (e.g., developing tree nurseries). Develop local strategies for a transition from biomass fuel to a mixture of fuels at the household level. In addition, foster a multisectorial planning approach for the management of fuelwood resources.
- *Ensure Community Participation*. Ensure that the local community has early input into the project design. (An absence of participation by project beneficiaries has been a common weakness of fuelwood projects.)
- *Reflect Economic Value*. Create fuelwood markets and adjust prices to reflect the true value of the forest resource. Often the biological, economic, and social values of forest resources are not incorporated into the total price of fuelwood.
- *Protect Resources*. Protect existing sources of fuelwood in natural forests. Ensure that these resources are being used sustainably.
- *Provide for Ownership of Fuelwood Resources.* Participate in a policy dialogue to establish legislation that provides for private/communal ownership and management of fuelwood resources.
- *Select Tree Species.* If trees are to be planted for fuelwood, select the most appropriate ones, drawing on local and national-level expertise. The short rotation required for fast-growing, exotic tree species allows for increased production of fuelwood; however, their rapid growth can also accelerate the depletion of soil nutrients or water resources. Fertilizer use can be considered for plantations of rapidly growing species.
- *Assess Potential For Improved Cookstoves.* Another means of encouraging fuelwood conservation is the popularization of improved cookstoves. Typically built of clay or metal, these stoves trap heat, causing firewood to burn more efficiently. Fuelwood consumption can thus be decreased. For example, in Rwanda and Mali, clay cookstoves have been widely adopted by communities in which they were introduced. Community-based organizations proved to be successful dissemi-

nators of improved cookstoves even though adoption of such stoves requires changes in traditional cooking methods.

Many tree species serve multiple wood and non-wood purposes, with fuelwood being a secondary product. For example, pruned branches from some *Prosopis* species can be used for firewood while the trees themselves can be used as living fences.

Develop Alternative Energy Sources

Fuelwood will remain the primary source of energy for many rural Africans for many years, but opportunities should be identified for forms of renewable energy. These should be simple, affordable systems adaptable to small-industry/private-enterprise development at the community level. While the cost of an alternative energy source may be a constraint, it can be minimized if long-term credit is available to resource users.

Solar Energy. The sun is an important source of clean and abundant energy, particularly in Africa. Photovoltaics (the process of converting sunlight into electricity) can bring limitless electricity to much of the world. The use of solar energy has not yet become widespread, since its use is still three to four times as expensive as that of other renewable energy sources.

Negative environmental impacts associated with solar energy include pollution caused during the manufacture of solar devices, acid battery spillage, and improper disposal of batteries (Asian Development Bank 1987).

Some examples of solar energy devices and associated potential environmental impacts include the following:

- *Solar Food Dryer*. A solar food dryer is a box with at least one transparent side through which solar energy raises the inside temperature and sets up a convection current of air. Fruit, grain, vegetables, have yet to be used, and fish can be dried inside. Food dries rapidly, allowing greater retention of vitamins than does direct sunlight.
- *Solar Ponds*. A solar pond operates on the same principle as the solar food dryer. Instead of trapping heat rays under a transparent window, heat is trapped under several layers of fresh and salt water. Unlike solar food dryers, solar ponds can create serious environmental damage. Because large amounts of salt are used, a leak in the bottom of the pond could seriously contaminate groundwater supplies. The steeply sloped sides of the pond may become a drowning hazard. Animals or small children could fall in and become trapped in the water. Because of the high temperatures, objects sinking to the bottom cannot be easily retrieved without special equipment. The hot brine of a solar pond corrodes many metals. Finally, water evaporated from the pond surface must be replaced by water from other sources.
- *Solar Stoves and Ovens*. At present, cooking with solar energy appears suitable only for baking or simmering over long periods of time. Most solar-disc reflector stoves require constant readjustment into the sun's light throughout the day. Foods that require frying or stirring are difficult to prepare with solar heat. Consequently, African women have not yet widely accepted cooking with solar energy. The initial cost of the device, restriction of cooking time to bright daylight hours, incompatibility of the type of local cuisine, and unfamiliarity with the device, are some of other deterrents to the dissemination of solar stoves and ovens.
- *Photovoltaic Cells*. While the technology for converting solar energy into electricity continues to become cheaper, its cost efficiency in Africa remains questionable. For a few modest tasks, solar cells have a greater chance of being appropriate. Maintenance of a photovoltaic system is limited to regular clean-

ing of the panel surfaces. Trained individuals must do the cleaning in order to avoid damage to the cells.

Biogas. Technologies used for the conversion of organic materials to biogas have been in existence for many years, but they have yet to be used in any large quantity in Africa. Biogas production involves the biological fermentation of organic materials (e.g., agricultural wastes, manures, or industrial effluents) in an oxygen-deficient environment to produce methane, carbon dioxide, and traces of hydrogen sulfide. The gas can be used either for direct combustion in cooking or lighting or indirectly to fuel combustion engines delivering electrical or motive power (Bokalders and Kristoferson 1991).

The operation of a biogas digester presents several potential environmental problems, but these problems can be minimized with proper planning and operation. Special precautions are required if human or hog wastes are used in this process. For example, humans and some animals share similar feces-borne parasites and pathogens. For this reason, some authorities warn that raw fecal waste is extremely dangerous and do not recommend applying sludge to soil where root and vegetable crops are cultivated. If the digester is built close to a lavatory or livestock shed, the excrement may be deposited directly without unnecessary handling.

The disposal of liquid overflow (supernatant) from the digester may occasionally present a problem. Normally this liquid is clear and odorless and has some value as a dissolved fertilizer. If water is scarce, the supernatant may be recycled into the digester with new organic feedstock. Otherwise, it can be used to water plants or moisten compost materials. With an improperly working digester, the supernatant may be dark and extremely offensive. If it is not recycled, this liquid should be buried or mixed with soil in an isolated spot.

As with natural gas, precautions must be taken to prevent biogas leaks. Surveillance is important, since biogas is usually odorless and difficult to detect. In closed rooms, leaking gas can lead to asphyxiation or explosion.

In areas where manure or dung is considered a free community resource, the installation of biogas digesters can cause unwanted changes in local economics. For example, if manure suddenly becomes more valuable than usual, it can become a marketable commodity that is no longer available to the poor. The question of who stands to lose or gain from an energy project is one that deserves attention in the initial planning stages.

Ethanol. Liquid fuel in the form of ethanol can be produced through the fermentation of biomass (e.g., sugar cane). The production of ethanol involves the washing, fermentation, and distillation of biomass. Kenya and Zimbabwe have established ethanol energy programs (Bokalders and Kristoferson 1991).

Solid residues from ethanol production can be disposed of easily as a high-protein dietary supplement for livestock; however, the disposal of liquid residues, which may amount to 12 to 13 times the volume of the final product, is more difficult. This "thin stillage" has a strong odor and high acid content and contains many organic solutes. Land application of thin stillage could be harmful to many types of soils, especially those with high clay content. Stillage should not be disposed of in areas where it can flow into and contaminate lakes and streams.

Significant amounts of water are used in the production of ethanol. For every unit volume of ethanol produced, approximately 16 volumes of water are needed to generate steam. This demand for water must be evaluated against its available supply and the merits of alternate uses.

Hydropower. Sub-Saharan Africa has exploited only 4 percent of its hydrological resources for energy purposes. If developed in an environmentally sound manner, the remaining reserves of hydroelectric energy could meet significant portions of the region's energy needs (UNDP 1992).

Certain conditions are required for usable energy to be produced from water resources. Hydropower for mechanical or electrical energy is produced when the pressure of flowing water is directed at a waterwheel, turbine, or hydraulic ram. In areas where a stream flows gently and a long channel is impractical, it is

sometimes useful to construct a dam across the stream. This creates a reservoir of water that can have both energy and nonenergy uses (e.g., irrigation).

Large small dams are widely viewed as environmentally problematic. Dams should be constructed only with assistance from skilled professionals. Even with assistance, all the problems associated with dams are not always immediately apparent. Some potential negative effects associated with small, local dams are indicated below:

- Flooding land behind the dam causes loss of vegetation and wildlife. There can also be an increase in soil erosion, reduction in land available for food production, and changes in water temperature, which can affect water quality.
- Alteration of normal stream flow reduces the availability of nutrients and sediment downstream for crops and fish. A dam can also threaten fish migrations.
- Dam construction can increase the incidence of waterborne diseases associated with large bodies of still water.
- Insufficient attention to an area's geology and topography results in a threat to public safety. A dam may not withstand the force of moving water if it is designed improperly.

Wind Power. If properly designed and well placed, wind machines can provide a reliable source of energy. A wind-powered water pump can be used for irrigation and supplying potable water.

One potential negative effect associated with wind-driven water pumps is that standing water around the pump from spillage can become a health risk. An automatic shut-off mechanism can potentially solve the problem. As with any water system, overgrazing near the water supply can be a serious problem.

3.10 AGROFORESTRY

Background

"Agroforestry" describes an agricultural system in which trees or shrubs are deliberately grown with food crops and/or livestock. Although the term is relatively new, agroforestry has been practiced in Africa for generations. Most traditional African farmers are aware of the value of trees. For example, shifting cultivators retain some tree species that provide products or enhance soil fertility.

While a wide variety of agroforestry systems exist, they all tend to retain and utilize a significant area as nonagricultural vegetation, rely largely on natural and locally available sources of soil nutrients, regenerate rather than deplete resources, and use sequenced cropping throughout the year to provide continuity in the supply of food, fuel, and income. Likewise, agroforestry systems can help alleviate three of the most important constraints in African agriculture: (1) low-fertility soils; (2) insufficient, erratic water availability; and (3) lack of animal fodder.

Range of Agroforestry Practices in Africa

Dispersed Field Tree Intercropping. Farm trees are grown within and adjacent to crop fields. For example, in semiarid areas, *Acacia albida,* a nitrogen-fixing tree can double yields from crops grown under its canopy and provide valuable browse for livestock.

Alley Cropping. This newly developed technique in the humid lowlands allows crops to be planted in the narrow alleys between rows of nitrogen-fixing trees or shrubs. Pruning from these perennial trees can be used as mulch, fodder, or fuelwood.

Windbreaks (or Shelterbelts). Continuous, uniform rows of trees are planted in crop fields perpendicular to the prevailing winds to reduce wind-induced crop damage, evapotranspiration, and soil erosion.

Living Fences and Other Linear Planting. Trees or shrubs are used to form living fences and hedgerows to mark field or garden boundaries, to control livestock movement, and to produce fuelwood and building material when they are pruned.

Taungya System. This system combines establishment of tree plantations with planting of food and cash crops. Farmers clear and prepare a site, plant their crops along with tree seedlings, and maintain both trees and crops for a few years until the tree canopy begins to close.

The taungya system can reduce the cost of tree planting and maintenance. In most cases, farmers work for low wages and eventually lose access to agricultural land and forest products. However, the taungya system can incorporate secure land tenure for rural communities to pursue farming, as well as forest development over the long term.

The adoption of agroforestry practices is often associated with improvements in soil fertility, increases in fuelwood and soil conservation rates, and increased fodder supplies. Sustainable agroforestry has the potential to increase agricultural productivity and reduce resource users' dependence on tropical forest resources. While it is often considered merely a subdivision of forestry, agroforestry has the potential to integrate into agricultural and social institutions.

Agroforestry systems can help alleviate three of the most important constraints in African agriculture: low fertility soils, insufficient water availability, and lack of animal fodder. In addition, agroforestry may have potential to provide local communities adjacent to parks and other protected areas with agricultural and economic benefits.

Potential Environmental Impacts

Despite the many benefits, of agroforestry, there are potential disadvantages, including the following:

- Shading by tree crowns can lower the yields and quality of associated agricultural crops beneath the trees.
- Competition between trees and associated crops for nutrients and water can reduce crop production.
- Competition for growing space can reduce overall crop yields.
- Tree harvesting can cause mechanical damage to food crops.
- The presence of trees can make hand mechanization and tilling more difficult.
- Increased air moisture content caused by trees can create conditions that favor fungal and bacterial food-crop diseases.
- The uptake of soil nutrients by trees over long periods can potentially reduce soil nutrients available for food crops.
- Trees often retain rainfall precipitation in their crowns, and, in some cases, water runoff from tree stems can adversely affect food crops below them.

Key Questions for Agroforestry

- What are the specific land types in the project area? What is the soil type, existing vegetation, and the area's proximity to roads, water resources, and markets? What are the area's climatic conditions?
- What are the major land uses in the area (e.g., shifting cultivation, game meat, protected areas, charcoal production, brickmaking, or cash-crop production)? For planning purposes, is it possible to develop a map of these land uses?
- Who uses the land? What are the ethnic group(s), ratio of men to women, farmers to herders, valley farmers to hillside farmers, and other distinctions? Where did the people originate? Are there preferred land-access rights based on ethnic group(s) or length of residence in the area?
- What are the most important resource/production problems at the household level? What are the obstacles to tree planting or agroforestry practices in the community (e.g., steep terrain, soil erosion, or poor rainfall)?
- What are the most important changes in land use in the area? What measures have been taken by resource users to stop soil degradation and to improve natural resources? What practices have external organizations or the government introduced? How have people responded to these practices?
- Are there conflicts or overlapping rights to land and trees among groups?
- What are the highest priority uses of trees, shrubs, and grasses? How are these trees used?
- What are the most likely locations for future tree-planting and agroforestry practices?

Suggested Actions for Agroforestry

Many potential negative impacts associated with agroforestry can be addressed during project design. Below are some suggestions for the establishment of an agroforestry project:

- *Establish Appropriate Policy Conditions*. Where possible, participate in putting policy conditions in place to provide incentives for farmers' adoption of agroforestry (e.g., land tenure or credit) and a reduction of financial risk associated with the interventions. The threat of a reduction in fuelwood availability may not be a sufficient incentive for farmers to plant trees. Farmers are often equally interested in other wood products, as well as nonwood products (e.g., construction poles, fruit, or medicine).
- *Provide Training.* Train farmers and extension staff in the use of field interventions. Training may include site visits by farmers and extension staff to promising activities. Training should be provided as necessary.

- *Establish Favorable Community Relations*. Establish a partnership between the project and the farmers. Farmers should have an opportunity during the project identification and implementation process to express their needs and preferences regarding biological and socioeconomic interventions.
- *Promote Adoption of Appropriate Practices*. Encourage farmers to practice agroforestry. Research may be conducted in a country, but ultimately, the true success of an agroforestry activity is the level of on-farm adoption. The integration of a practice into a farmer's land-use system is a good indication of success. This adoption may also be promoted by encouraging and assisting key farmers to visit other farmers in the region. Where pesticide use is contemplated, such as nursery and transplanting, refer to Appendix C, Safe Pesticide Use Guidelines.
- *Encourage Flexibility*. Avoid preconceived biases about local problems and how they should be solved. Successful projects tend to be flexible and make use of information resulting from formal or informal monitoring to make changes when needed.
- *Ensure Sustainability*. Place mechanisms to enable farmers to cover recurrent costs, maintain tree tenure, and obtain technical advice. A revolving fund, coordinating association, or annual workshop can ensure support to project beneficiaries.

3.11 INTEGRATED CONSERVATION & DEVELOPMENT PROGRAMS

Problem Identification

Most of Africa's protected areas were established without much consideration of the surrounding rural communities. The people in these communities are typically very poor and receive few benefits from protected areas. Conventional approaches to protected-area management have often not considered the needs of these rural communities.

Innovative approaches are needed both to conserve and economically develop Africa's protected areas. As discussed below, there is now wide recognition that successful long term management of protected areas depends on the cooperation and support of local people. In some cases, an integrated conservation and development project (ICDP) approaches are being attempted to help address the needs of nearby communities. Such an approach emphasizes local participation in both protected-area management and rural development activities.

Potential Environmental Impacts

Africa's protected areas support a wide range of important products. African people depend, to a large extent, on forests for wild plant and animal products, food, fiber, shelter, and medicine. The forests are also a source of foreign exchange (e.g., timber or tourism) and insurance for the future -- storehouses of important genetic material needed to improve Africa's staple food crops and livestock.

Potential negative impacts from unsustainable management of protected areas include a loss of wildlife and associated habitats, deforestation, loss of water resources, reduction in aesthetic value, increased pollution, reduction in long-term revenue from tourism, and poor living conditions for rural people living adjacent to the protected areas.

If managed more effectively, many of Africa's protected areas could be a sustainable source of both consumptive resources (e.g., game meat or fuelwood) and nonconsumptive resources (e.g., tourism). Unfortunately, many of Africa's protected areas are not managed sustainably. As a result, important wildlife habitats are being degraded, and benefits associated

with protected areas are not being captured locally or nationally.

Causes of Negative Environmental Impacts

Many negative effects are associated with degradation of Africa's protected areas. Some of these are poor local and national planning (e.g., infrastructure, policies, unregulated tourism use); inappropriate policies (e.g., revenue management and wildlife utilization regulations); inadequate institutional capacity and management (e.g., poorly paid and trained staff, lack of equipment, and lack of strategic management plans); and absence of partnerships between protected-area managers and local communities.

These causes are often symptomatic of larger national economic and institutional development problems. For example, institutions managing natural resources often have insufficient budgets to provide necessary trained staff and field equipment. Government ministries may not be organized in a way that encourages a multidisciplinary approach to protected-area management. Furthermore, protected-area managers in Africa are often not provided career incentives or professional recognition for work at remote sites.

Key Questions for IDCPs

- Based on a project's objectives, what biological and socioeconomic information is needed to design, implement, and monitor project activities?
- What is the impact of fire on protected-area resources?
- What infrastructure facilities are needed in the protected area (e.g., roads, campsites, trails, water supply, or cabins) and where should they be located? (The opinions of tour operators and owners of nearby tourist lodges should be assessed.)
- What is the tourism potential of the protected area? How many tourists should be permitted to visit the protected area during different times of the year? What types of experiences would they like to have? (For example, determine if the visitors would be more interested in learning from local people and how they use the forest or in viewing wildlife.)
- What level of conservation training is needed by protected-area staff to manage the park and communicate effectively with local communities? What is the best way to provide this training?
- How do local communities use the protected area? Can they be provided economic alternatives to unsustainable use of the protected area?
- Are certain vegetation types and wildlife species going to be promoted in the protected area?
- What type of monitoring system is needed to measure the link between the project's community development activities and biological changes in the park?

Suggested Actions for IDCPs

Develop a Protected-Area Management Plan. Develop such a plan as one of the first steps in managing a protected area. A management plan specifies objectives and key questions, which are used to design, implement, and monitor project activities. The plan identifies the needs of local resources users, protected-area boundaries, policies in need of reform, land-use categories (e.g., conservation, tourism, research, and buffer zone), and a process for the design and implementation of protected-area and community-development activities.

Given the time, financial requirements, and expertise required for the development of a comprehensive management plan, NGOs should be encouraged to develop alternative approaches to traditional, protected-area planning. Targeted, problem-oriented planning requires adequate attention.

The results of the management plan should enable project staff to design project activities. Specific activities will vary according to the nature of the

protected area and objectives for its management. Potential implementation activities include:

- infrastructure development within the park (e.g., protected-area demarcation, trail establishment, road improvement, and campground establishment);
- tourism development and associated policy reforms (e.g., private-sector incentives, coordination of beneficiaries, communications and promotion, and strengthening environmental monitoring capability);
- rural development activities for communities adjacent to the protected area (e.g., handicrafts, health facilities, schools, potable water access, provision of game meat, and employment);
- conservation education (e.g., interpretive-area information, guided tours, and public relations); and
- training for protected-area managers and rural communities (e.g., in fire management, field biology, tour management, trail maintenance, and community development) (Biodiversity Support Program 1993).

Assess Policy Conditions. Assess both the national and regional context within which protected-area management activities are to be implemented. A framework should be developed to identify the potential political, cultural, and socioeconomic issues that can influence proposed conservation initiatives.

For example, some resource users may already be protecting forest resources for their religious value. In West Africa, some local communities believe that forests harbor forest spirits. It is important for development planners to ensure that economic policy reforms do not negate existing social values and incentives for the sustainable management of forest resources.

Some approaches to consider regarding the national and regional context are listed below:

- Assess and respect national laws and regulations regarding forest management and local resource users.
- Integrate resource management into other initiatives. National or regional structural adjustments, policy reforms, and other macro economic initiatives can affect the management of a forest.
- Calculate the present national natural-resource capital. Determine where and how fast it is being depleted. Determine how economic restructuring and increased production will affect resources, both quantitatively and qualitatively.
- Ensure that senior government officials become familiar with economic incentives that might be used to conserve biodiversity. Identify how national and international institutions can be structured to achieve these ends.
- Identify opportunities to link resource management activities to other economic development initiatives (e.g., agricultural research, education, and health).
- Determine the government's policy regarding the management and utilization of wildlife. Determine if a wildlife utilization scheme could be developed.
- Identify the area's land-tenure system and determine how it will affect the adoption of interventions by resource users.
- Assess how tourism revenues are presently managed. Identify the lessons learned from other African regions or countries regarding the management of park revenues.
- Identify local attitudes toward natural resource use. Determine how the resources are presently being used. Identify cultural and economic factors that are influencing resource management at the local level.

Some examples of additional information needed in-

clude:

- *Testing Assumptions*. Identify and field-test methods for measuring ecosystem changes (positive and negative) over time as a result of rural development interventions.
- *Identification of Lessons Learned Regionally*. Identify lessons learned from regional NGO workshops. For example, obtain information on whether these workshops have led to consistent or standardized field methodologies, establishment of NGO field-project partnerships in which the comparative advantage of one NGO benefits another, or changes in NGO projects or resource-user behavior regarding the sustainable use of natural resources.
- *Collaboration With Other USAID Initiatives*. Identify instances in which other USAID activities (e.g., agriculture, education, or private-enterprise development) are contributing to ICDPs.

Box 3.4 Integrated Conservation and Development: Lessons Learned

Most of the IDCPs in Africa have been implemented only over the past few years. The following is a list of preliminary lessons learned from these projects.

- **Assumptions and Linkages.** Designers of ICDPs typically assume that if local communities receive benefits from rural development activities, the protected area will be used sustainably. This hypothesis is in the early stages of being validated, qualitatively and quantitatively. This strongly indicates that most ICDPs should design simple, appropriate monitoring systems to test the link between change in behavior of resource users and the ecosystem.
- **Appropriate Policy Conditions**. It is helpful to use national regulations, policy conditions and institutions to influence the implementation of project activities. An ICDP should be established only where ecological, community, and policy conditions are conducive.
- **Community Participation**. Community participation in a project's design and implementation is important. Effective projects require understanding among all stakeholders. Establishing a communication process with the community for decision making is critical. During the design phase, project feasibility should be questioned if a process for conflict resolution cannot be established within the community.
- **Indigenous Knowledge**. Indigenous knowledge needs to be incorporated into the project design. This procedure leads to projects that are more sustainable.
- **Empowerment of Local Community**. Local control over and sustainable access to protected-area resources need to be promoted. It is important for local people to limit outsider's access to these resources.
- **Link Between Conservation and Community Benefits**. Resource users should perceive clearly the relationship between conservation and community benefits. Viable economic alternatives must exist for individuals to adopt sustainable practices.
- **Impact Monitoring**. Appropriate monitoring systems should be designed to test the link between community well-being and changes in the ecosystem (positive or negative impacts). Test the assumption that communities will conserve protected-area resources if the communities receive tangible benefits from such conservation (Booth, 1993).

3.12 AGRICULTURAL PEST MANAGEMENT

Problem Identification

In Africa, as elsewhere in the world, crops and domestic animals are subject to attack by many pest organisms. Recent FAO estimates of worldwide annual field and post-harvest crop losses due to pests range from 20 to 40 percent, and probably higher in developing countries, with a potential value of about U.S.$ 300 billion (National Resources Institute 1992). Pests not only affect crops, but many species severely affect humans, domestic animals, and wildlife, causing significant economic losses and untold suffering.

Pest management is an integral part of the crop production process as one other agronomic practices. To the extent that many NGOs and PVOs are engaged in even minor agricultural activities, such as promoting vegetable gardens and other small-scale crops, such organizations implicitly deal with pest management. If this relationship is overlooked, and local farmers are not using pesticides, the opportunity exists for further encouraging the adoption of preventive, nonchemical pest management measures.

Conversely, if farmers are already using pesticides, NGOs and PVOs risk missing the opportunity to foster the adoption of improved, sustainable pest management techniques, while tacitly supporting inappropriate pesticide management and crop protection practices. In a recent survey of NGOs in sub-Saharan Africa, 86 percent of the 68 NGOs that responded to survey questionnaires indicated that local farmers use synthetic pesticides, mainly on vegetable crops (IPM Working Group 1994). The survey also revealed that over 50 percent of the NGOs employed between one and ten full time agricultural staff, indicating a significant involvement in crop production, irrespective of main program objectives.

In developing countries, where public sector support for agricultural research and extension is usually inadequate, crop protection in general and integrated pest management (IPM) in particular, have traditionally received little attention. The trend has been to concentrate resources on breeding and agronomic programs and to deal with pest issues casually by relying on simple chemical control techniques. This policy can be traced to the input-oriented thinking that characterized the Green Revolution. Academic training and research in the crop protection disciplines (entomology, plant pathology, nematology, and weed science) and IPM in universities and middle-level schools is likewise inadequate. In consequence, there is an insufficient number of adequately trained crop protectionists, and even fewer having IPM expertise.

The FAO defines IPM as "a pest management system that, in the context of the associated environment and the population dynamics of the pest species, utilizes all suitable techniques and methods in as compatible manner as possible and maintains the pest populations at levels below those causing economic injury." USAID promotes IPM approaches in its programming.

IPM often is misunderstood or erroneously interpreted to mean nonchemical pest control (zero pesticides) or biological control. Other individuals mistakenly assume that IPM automatically includes the use of pesticides. IPM is frequently and incorrectly perceived as being too complex to be practical by decision makers, donors, PVOs and NGOs, and even by many agronomists and crop protectionists. IPM adoption generally requires greater extension and training efforts than do simpler Green Revolution-style, pre-scheduled pesticide applications, but an IPM program does not necessarily need to be unduly complex or include every available control technique.

The role of traditional crop-management practices, which often have built-in pest management functions, have seldom been well understood or appreciated by western science or the development community, even though much of it is based on hundreds or thousands of years of agricultural experience (Matteson et al. 1984; Thurston 1990). The introduction of unsuitable pest management technologies and the disruption of indigenous farming practices can, in the end, exacerbate pest problems and lead to unexpected adverse environmental consequences.

Potential Environmental Impacts

Pesticide poisoning

The immediate consequence of direct exposure to some pesticides in humans is acute intoxication, with effects that can range from a slight discomfort to death. According to WHO/UNEP estimates, each year there may be as many as 1 million human pesticide poisoning cases, resulting in 20,000 deaths, worldwide (Pimentel et al. 1992). Those at greatest risk include farmers, pesticide applicators, field workers, and rural families in general.

Long-term human health risks

Although long-term health problems linked to pesticides are more difficult to document than acute cases, exposure to low pesticide levels over long periods has been linked to afflictions such as neurological disorders, respiratory ailments, allergies, skin ailments, sterility, birth defects, propensity to tumor formation, and even cancer (Davies et al. 1982). Similar risks extend as well to consumers of fresh and processed commodities containing pesticide residues that substantially exceed maximum acceptable levels established by WHO/FAO, European countries, or the USEPA.

Soil contamination

The accumulation of pesticides in the soil can severely reduce its macro- and microbiota, including earthworms, arthropods, fungi, and bacteria. Accidental spills on land, usually associated with pesticide mixing and loading operations, can result in localized but severe soil contamination if not contained and dealt with rapidly and adequately.

Effects on surface and ground water

The intense use of pesticides in agriculture can lead to the contamination of surface and ground water. Water runoff resulting from heavy rainfall can transport pesticides and their metabolites to distant places located downstream, contaminating lakes, lagoons, reservoirs, ponds, and estuaries, and adversely affecting aquatic organisms. Discarding pesticides, washing spray equipment, or rinsing empty pesticide containers in or near streams and rivers can have similar adverse effects.

Pesticide drift

Spraying against the wind can lead to an applicator's intoxication. Herbicide drift, which is caused by spraying on windy days, can damage nontarget crops and native vegetation within reach. Insecticide drift can be deadly to nontarget organisms, including beneficial arthropods. Pesticide drift can also expose people to risks associated with such chemicals.

Effects on nontarget organisms

Wide-spectrum insecticides not only destroy target insect pests but also nonpest arthropods, including beneficial species, within reach. Pollinators and insect pests' natural enemies (parasitoids and predators) are especially vulnerable. Some pesticides are toxic to birds and fish.

Disruption of natural control

By eliminating pests' natural enemies, excessive insecticide use can exacerbate pest problems and create new ones. Without natural enemies to keep them in check, pest populations can recover faster from the effects of a pesticide application than was possible in the presence of a healthy natural enemy fauna. This effect is known as pest resurgence. Similarly, intensive pesticide use can trigger the emergence of new pests, as natural enemies that normally keep some plant-feeding species from proliferating are eliminated. Under such conditions, potential and secondary pest species can acquire key pest status.

Pesticide resistance

The development of genetic resistance to pesticides in pest organisms is another adverse consequence of pesticide overuse. Through 1990, at least 504 species of insects and mites, 150 species of pathogens, 273

weed species, 2 species of nematodes, and the Norway rat had developed resistance to at least one pesticide (Arnold 1992; Pimentel et al. 1992).

Externalities: *Accounting for economic costs of human health and environmental impact*

"Externalities" are the hidden costs associated with pesticide use, such as lost productivity due to chronic pesticide poisoning and lost ecosystem services such as the activity of natural enemies against pests. Unless these costs are accounted for, the cost to society for the reliance on chemical intensification to increase productivity will be under recognized. For example, in groundbreaking work on rice in the Philippines, it was shown that when the health costs arising from pesticide exposure are included in the production budget, the most efficient and profitable pest management strategy can be natural control (Rola and Pingali 1993).

Causes of Negative Environmental Impacts

The introduction of unsuitable crops, cropping systems, and crop-management practices can negatively affect the ecological balance of diverse and stable agroecosystems in sub-Saharan Africa . For instance, cotton grown as a monoculture tends to develop serious pest problems and an increasing dependence on chemical control within a few seasons. Rice and wheat, grown as monocultures, are subject to intense competition from weeds and often require at least one herbicide application per season.

High-value crops grown for export, including vegetables, fruits, and cut flowers, are often highly susceptible to pest problems and have high market-imposed quality requirements. In consequence, such crops tend to be treated with pesticides more frequently than are crops grown for domestic consumption. It is not unusual, in such cases, that as pest problems worsen due to pesticide overuse, farmers feel compelled to spray more often, thus contributing to the perpetuation of this vicious circle.

The shift from low-input, highly diversified cropping systems to high-input, large-scale monocultures can exacerbate pest problems in several ways (Matteson et al. 1984; Altieri 1995). In addition to the detrimental effects that pesticides have on natural enemies, the introduction of monocultures often results in a loss of natural enemy diversity. Traditional mixed cropping systems, with their wide plant diversity, contain the conditions and resources (refuges, pollen, honey, hosts, and prey) needed to support diversified natural enemy populations, which, in turn, contribute to keep populations of plant-feeding species from reaching damaging levels.

Depending on implementation scale and other factors (Altieri 1995), some advantages are lost in monocultures, severely affecting natural enemies' abundance and effectiveness. In contrast, monocultures offer such a vast and continuous source of food-shelter in time and space to specialized herbivorous species that some of these proliferate to a degree not possible when these resources were less available and plentiful.

Similarly, the introduction of irrigation allows crops to be grown year round but also allows some pests to survive and thrive throughout the year, as a new source of food and shelter becomes available during the dry season. These unforeseen pest problems can often lead to increased pesticide use and adverse health, environmental, and economic effects.

Together with increasing dependency on pesticide use, inappropriate pesticide handling and application practices are the direct causes of adverse environmental, health, and economic impacts. Inadequate local policies, regulation, and enforcement pertaining to the manufacture, import, formulation, packaging, labeling, transport, storage, sale, handling, application, and disposal of pesticides and their empty containers contribute to the increasing environmental and health risks associated with pesticide use in developing countries (see Appendix C).

Key Questions for Pest Management

- Are NGO/PVO extensionists familiar with a project's crop production systems and practices?

- Are extensionists thoroughly familiar with the key pest organisms and the natural enemies of insect pests in project areas?
- Do extensionists have adequate training in IPM and pesticide management?
- How well do farmers understand the main pest problems affecting each target crop?
- Are farmers already dealing adequately with at least some pest problems through their traditional crop-production practices?
- Are there significant deficiencies in the way that farmers recognize and deal with pest problems?
- Are data on crop losses available? How much pest injury can a target crop withstand before an economic loss occurs?
- If pesticides are applied, how is the decision made as to when and how to apply?
- Do action (economic) thresholds, even if relatively crude, exist for main crop pests? Are these being used by farmers?
- Are there available nonchemical control alternatives that have not been tried yet?
- Has the NGO/PVO identified national or international sources of IPM expertise. Has it established linkages with local universities, research stations, NGOs, donors, crop protection programs, and individuals having expertise in IPM?
- Does the NGO/PVO have any strategies for dealing with pest and pesticide-management issues affecting its projects?
- Has the NGO/PVO developed and adopted its own pest and pesticide-management policy?
- Does the NGO/PVO have access to appropriate training and extension materials, such as posters, pamphlets, slides, and pest reference collections?
- Will the project support the use of pesticides, either directly by providing these inputs or indirectly by providing crop protection guidance or technical assistance on crop protection?

For additional questions pertaining to safe pesticide use refer to Appendix C.

Actions Suggested for Pest Management

*Integrated Pest Management Initiatives**

Pests of humans, crops, wildlife, and domestic animals cause vast economic losses and human suffering in Africa. In traditional agricultural systems, in which pesticide use is minimal or nonexistent, indigenous nonchemical pest control methods are generally effective against many nonmigratory pests. As the impact of the green revolution continues to expand, however, an increasing number of small farmers have turned to pesticides to combat pest problems.

IPM represents an economically and environmentally sound answer to pests. IPM relies primarily on preventive, nonchemical control measures, using pesticide application as a last resort. IPM can also be defined as a decision-making process for determining if, when, and where pest control is needed, as well as the blend of control tactics to use. The application of IPM approaches is not restricted to agricultural pests, but also applies to other pest groups, including forest, urban, and household pests, as well as pests of medical and veterinary importance.

Successful IPM programs have been developed for various pests of food crops in several developing countries, such as for rice pests in Indonesia (the largest and most successful to date), maize in Nicaragua and Honduras, vegetables in the Dominican Republic, and potatoes in Peru.

Strengthen In-House IPM Capabilities

The strategic importance of acquiring adequate in-house IPM expertise cannot be overemphasized. NGOs/PVOs should increase their IPM capabilities by providing appropriate training to their extensionists and/or by recruiting individuals having specialized training and experience with IPM.

There is no simple formula for determining what

* Refer to Appendix D for a more detailed description of technical aspects of implementing IPM.

should be an adequate level of IPM capabilities for a NGO/PVO. For instance, an organization implementing limited agricultural activities may assign IPM responsibilities to a single individual, who in turn will train and assist other extensionists, as needed. As a general rule, however, all extensionists engaged in crop-production activities should receive training in IPM. A major agricultural program with a strong crop protection component may require, in addition, one or more full-time IPM specialists to help develop and implement IPM activities.

A two- to three- week workshop, presented by IPM practitioners and covering the topics listed below, is recommended for project extensionists. Qualified IPM specialists and trainers can usually be found in universities, agricultural research centers, regional and international agricultural organizations, the agribusiness sector, and the ministry of agriculture. The initial training should be supplemented by brief annual workshops on selected IPM topics.

Recommended IPM Workshop Topics

- characteristics and phenology of target crop(s);
- field identification of key and secondary pests of target crop(s) (diseases, nematodes, weeds, insect, mites, vertebrates) and characteristic crop damage;
- identification of common natural enemies (see Table 1 in Appendix C);
- theory and application of IPM;
- principles and application of biological control techniques, emphasizing the conservation of natural enemies;
- cultural and mechanical control methods;
- behavioral control methods;
- principles and application of chemical control;
- economic injury and action thresholds, crop loss assessment, sampling techniques, monitoring pest populations;
- environmental, health, and economic consequences of pesticide use;
- principles and application of pesticide management (refer to Appendix 1 for a detailed description of this area);
- extension and training techniques;
- socioeconomic considerations in the implementation of IPM.

Create and maintain an IPM reference library and explore opportunities offered by sources of computerized IPM information and online services. Create reference collections for key insect pests of target crops and their natural enemies. Maintain photographic and slide records of diseases, weeds, and project-promoted and indigenous crop-protection practices. Much of this reference material can also be used to support training and extension programs for farmers, as well as for use in project monitoring and evaluation activities.

Establish Linkages with Sources of IPM Expertise

Avoid working in isolation and build strong linkages with national and international organizations and programs, as well as individuals, having relevant expertise in IPM. For such end, consider other national and international NGOs/PVOs, national, regional, and international research institutions and crop protection programs, national and foreign universities, and the national crop protection services. Collaborate with USAID and other donor agencies, progressive farmers, and crop protectionists in the private sector who might be interested in mutually profitable IPM undertakings. Identify and take advantage of emerging relevant electronic media networks and online services. Participate in seminars, workshops, and meetings focusing on sustainable agriculture and IPM topics.

The establishment of such linkages can provide access to training and technical assistance for NGO/PVO extensionists, as well as training and extension material for farmers. CARE, for example, is successfully implementing an IPM project for potato pests in Peru, in collaboration with the International Potato Center. Such an arrangement brings into play the

Center's technology-generation capacity and CARE's proven extension capabilities and close links with farmers, in a synergistic relationship that benefits both institutions (WRI 1996).

Extension and Training

The effectiveness of efforts to transfer IPM technology depends primarily on demonstrations, training, and technical assistance. Field days are an effective tool to teach diagnosis of plant diseases, pest identification and sampling techniques, crop-pest and pest-natural enemy interactions, cultural control methods, and correct pesticide application and safety practices.

On-farm demonstration of IPM approaches is indispensable for their tentative acceptance by farmers. In addition to their effectiveness as pest control tools, IPM options should be practical and simple (Matteson et al 1984) and should not be disruptive of traditional farming practices or require an excessive investment of farmers' time or resources.

The cost-effectiveness of training and extension activities can be maximized by focussing them on farmers who will function as promoters and train fellow farmers. Special training for extension workers and educational programs for government officials and the public are also important. An IPM program should have the capacity to establish demonstration plots, conduct field days, provide technical assistance, and produce extension materials, if so needed, all of which should be developed in consultation with the farmers.

If suitable training and extension materials are not readily available, consider designing, producing, and disseminating materials, such as posters, pamphlets, pest summary sheets, and simple crop-specific IPM guidelines. Assemble insect pest-reference collections and use them to train farmers. Most adult insects can be pinned and displayed in entomological boxes. Larvae and soft-bodied adults, such as aphids, can be displayed in sealed vials containing 70 percent alcohol. Similarly, weeds can be pressed and preserved in herbaria. Maintain photo and slide collections of plant diseases, insect pests and their natural enemies and examples of pest damage for use in training sessions. Training videos produced on location tend to elicit considerable interest in rural communities.

It is also essential to involve farmers in decision making about IPM by offering them pest-management options, rather than single packages. If available IPM techniques are presented as a menu of options or as a tool box, farmers will be encouraged to select, experiment with, adopt, modify, and discard practices, according to their perceived usefulness.

Research

Few PVOs and NGOs have research capacity, and long-term research is best left to organizations that have the necessary capabilities and resources. NGOs/PVOs can stimulate such organizations to undertake adaptation and validation research in selected IPM areas and can collaborate with them in these efforts. Even when a NGO/PVO is unable to elicit or support the most elementary adaptive research, it should try to assemble crude crop-specific IPM guidelines, based on available information, to be validated during program implementation.

Evaluation

Once IPM activities begin, suitable evaluation mechanisms should be established to monitor the progress of adoption by participating farmers. There should be consensus on the criteria and indicators used to measure progress. Consider factors such as proportion of farmers adopting various combinations of IPM techniques, changes in patterns of pesticide use, reduction in pest losses, increases in crop yields, decreased crop production costs, and positive impacts on health and the environment. The evaluation process should also assess the effectiveness of training and extension methods and materials in order to identify deficiencies and introduce suitable modifications, as needed.

Nonchemical management methods

To promote adoption of sustainable pest-management interventions, it is essential to emphasize nonchemical

Box 3.5 Farmers' Field Schools for Integrated Crop Management

Educators have long known the power of learning by doing—acquiring knowledge and skills through one's own experience, observations, analysis, experimentation, decision making, and practice. Similarly, farmer participation at all stages is now recognized as essential to the successful development and implementation of appropriate agricultural technologies, including IPM. These principles are applied by the Farmer Field School extension approach, which has proven successful for implementing IPM in irrigated rice and vegetables in Indonesia and other Asian countries.

Post-Green Revolution increases in agricultural productivity depend on an understanding of crop ecology and on the exercise of crop management and decision-making skills which conventional extension approaches are unsuited for transmitting. Large-scale national extension systems typically retain a traditional top-down approach to extension training. This approach assumes the passing of knowledge and advice from the extension agent teacher to the farmer student. Farmers are expected to listen and comply. Extension messages are uniform for an entire country or region, rather than being tailored to individual farm conditions. Two-way communication is supposed to take place, but, in practice, farmers' knowledge, ideas, circumstances, and needs are often ignored.

In addition, T & V training of farmers and extension agents typically takes place largely in the classroom, in the form of lectures, between cropping seasons. It is difficult for farmers to relate the curriculum to their own experience and circumstances, and they have little opportunity for hands-on practice or dialogue. As a result, farmers' learning and motivation are diminished, which in turn reduces extension agents' motivation. Farmers are left with little desire, capacity, or self-confidence for trying new things.

The term "Farmers' Field School" does not refer to a brick-and-mortar building. Rather, it refers to a participatory, learning-by-doing process that takes place at frequent (usually weekly) intervals during the cropping season, entirely in farmers' fields. The only requirements are an appropriately skilled trainer and the crop itself. Farmers need not be literate.

The extension agent assumes the role of consultant and facilitator, with a group of 10 to 20 farmers as equal partners. Through dialogue, all parties combine their individual skills, knowledge, and experience to discover how best to manage the farmers' own agroecosystem.

Subgroups of 4 to 5 farmers make their own weekly analysis of their crops' agroecosystem, observing field conditions and illustrating them with a diagram showing significant features such as soil and weather conditions, crop stage and variety, and the relative numbers of pests and their natural enemies. Extensionists guide farmers' discovery process by responding to their questions with other, leading questions rather than by answering directly, supplying missing information only as necessary. Using their drawing as a basis for discussion, each subgroup of farmers decides the needs of each crop during the coming week. For protecting a crop, emphasis is placed on avoiding pest buildup through good management of pest-tolerant cultivars, including the preservation and augmentation of predators and parasites that normally keep pests under control.

Natural enemy numbers as well as pest numbers are considered when deciding whether pest management is necessary. Nonchemical pest management methods are preferred in order to avoid killing a farmer's friends, pesticides being applied only as a last resort. Each subgroup of farmers explains its decisions to the entire group. Discussion and debate follow.

Farmers' experiments, such as insect zoos in which they can observe pest and natural enemy biology, interactions, and relative susceptibility to pesticides, enhance the learning process. Group exercises improve communication and group solidarity and demonstrate the advantages of cooperation. Periodic follow-up by the extension agent during subsequent cropping seasons reinforces the learning process.

Farmers and extension agents enjoy this interactive, empowering experience. Farmers emerge from the Farmers' Field Schools with the knowledge, skills, and self-confidence necessary for them to be independent crop managers. They are motivated to add to their knowledge but are no longer dependent on a constant stream of advice from an extension agent. They are also well prepared to generate and test their own ideas for improving crop productivity and to train others.

Source: Matteson et al 1995.

methods. The following is a representative checklist of potential options.* Appendix D provides a more detailed treatment of selected IPM tactics.

- Management of insects and mites
  - Environmental manipulation: Crop rotation, crop diversity, intercropping, timing of plant ing and harvesting, soil tillage, sanitation, trap crops, water management, etc.
  - Biological control: Conservation and augmentation of natural enemies (predators, parasitoids, and pathogens).
  - Microbial insecticides: preparations of fungi *(Beauveria, Metarhizium, Entomophthora*, etc.) and bacteria *(Bacillus thuringiensis).*
  - Botanical insecticides: neem, garlic, capsaicin, rotenone, pyrethrum, etc.
  - Physical and mechanical control: screens, traps and baits, insect-proof storage and packaging, barriers, hand picking, diatomaceous earth, flooding, flaming and burning, diatomaceous earth.
  - Behavioral control: pheromone traps, attractants, feeding deterrents, repellents.

- Management of plant diseases
  - Environmental manipulation: Sanitation (destruction of crop residues and infected plants), intercropping, crop rotation, destruction of alternate host plants, water management.
  - Use of resistant plant varieties.
  - Planting disease-free seed and propagating material.
  - Vector control

- Weed management
  - Biological control using herbivores (managed grazing).
  - Environmental manipulation: seed bed preparation, seeding and planting methods, crop rotation, seeding rates and row spacing, tillage, irrigation and water management, fertilizer management, sanitation, green manures and cover crops, revegetation of weed-infested grazing lands, planting highly competitive crop and forage species, oversowing.
  - Physical and mechanical control: hand weeding, flaming and burning, solarization.
  - Planting weed-free seed and propagating material.
- Vertebrate pest management
  - Physical and mechanical control: visual, sound, and physical repellents; exclusion.
  - Chemical repellents.
  - Trapping and shooting, relocating .
  - Environmental manipulation.

Pesticide Management Initiatives

If pesticides are to be used at all, observe the precautions and recommendations provided in Appendix C. Two useful references include Davies et al (1982) and Overholt and Castleton (1989). Assistance of a pesticide management and training specialist can be useful during initial training and planning.

Policy Initiatives

Support activities and policies that foster the adoption of sustainable agricultural practices, including IPM. Support efforts intended to discourage pesticide subsidies, pesticide donations not linked to specific and urgent pest management needs, bank-imposed credit requirements that promote pesticide use, and other actions that increases the unsupervised availability of pesticides to small-scale farmers. Support initiatives that encourage the understanding and imple-

* Based in part on a Supplemental Environmental Assessment of pesticide management options for NGOs in Mozambique (Fisher et al 1994).

mentation of IPM, such as information-exchange meetings, seminars, and workshops, as well as training and research activities. Develop and adopt an IPM and a policy on safe pesticide use. Encourage and support the development and adoption of national IPM policies.

3.13 WATER SUPPLY AND SANITATION

Problem Identification

Careful planning for water and sanitation projects is required to prevent negative environmental impacts. Effective project design and community training (e.g., hygiene and equipment maintenance) are most important in preventing such impacts. The contamination of water resources can seriously affect the environment, and poor water quality can have serious health consequences.

The objectives of water-supply and sanitation projects are to eliminate excreta from the community environment and improve environmental health and hygiene.

Potential Environmental Impacts

Water and sanitation projects consider such potential environmental impacts as depletion of fresh water resources; bacteriological or chemical contamination of aquifers and surface water; creation of standing, stagnant water, which breeds disease-carrying insects; soil erosion and siltation of water resources; and degradation of terrestrial, aquatic, and coastal habitats and associated wildlife.

Causes of Negative Environmental Impacts

Environmental impacts associated with water and sanitation projects often stem from poor planning. It is important that the community participate in the planning process and project design. Projects with strong community involvement are almost always more environmentally sound than otherwise would be the case.

Training of targeted resource users is also important. While designers may make every effort to develop good designs, improper use of water systems and poor maintenance can result in environmental problems, many of which can be avoided through implementation of training programs.

It is also important to ensure that water-supply projects are linked to sanitation projects. Without proper sanitation, water-supply projects are worthless to the community and can have negative environmental effects. For this reason, communities must be trained in the use of hygienic practices and maintenance of latrines.

Key Questions for Water Supply and Sanitation

- Are there any potentially sensitive terrestrial or aquatic areas near the proposed project site?
- Has a land-use plan been completed for the area or region? Are there conflicting development efforts planned near the project site?

Suggested Actions for Water Supply and Sanitation

Consider Environmental Concerns During Project Design. Project designers should ensure that all projects:

- maintain or enhance water quality;
- are located on sites that are compatible with present and future land-use capability;

- use water efficiently and establish proper drainage systems;
- do not adversely affect plant or wildlife populations in the project area;
- maintain or improve soil productivity;
- examine water rights of existing users; and
- do not create conditions that encourage an increase of waterborne disease or populations of disease-carrying insects.

Establish Appropriate Facilities. Projects should include the facilities required to bring safe water to project beneficiaries and maintain a safe water supply. These facilities may include:

- dams or reservoirs for the collection and maintenance of water resources;
- pipelines, channels, or other water conveyance systems;
- water treatment and distribution systems;
- water-use monitoring and metering systems;
- wastewater collection systems; and
- sanitary latrines.

Regulate Water Use. Project planners should investigate opportunities to assist communities to manage water resources effectively. Some suggestions are to:

- determine sustainable water yields;
- regulate or ration pumped water use;
- control waste;
- provide training to communities on the sustainable use of water systems; and
- establish appropriate water-use price schemes.

Provide Proper Drainage Systems. Proper drainage systems in all water supply projects prevent collection of standing and stagnant water. Waste-control programs and health education can deter the spread of diseases and minimize soil erosion associated with stagnant water.

Provide Training. Negative environmental impacts associated with water and sanitation projects can be lessened through training programs. Suggested topics include:

- health and hygiene measures necessary for the protection of water supplies;
- selection and design of sanitation facilities;
- proper sitting of facilities with respect to water supplies;
- design of facilities with respect to operation and maintenance; and
- operation and maintenance of water systems.

Information needed on this subject includes:

- determination of a safe yield of water at the site;
- a community's preproject preferences regarding water resources;
- location of important wildlife habitats that the activity can affect;
- assessment of the site's environmental carrying capacity;
- the community's institutional capacity to participate in the project; and
- determination of policy reforms and training needed for the project's sustainability.

3.14 CONSTRUCTION

Problem Identification

Construction processes, such as preparation of construction sites, rehabilitation of existing structures, or completion of final structures, may have potential environmental effects. Projects require such diverse constructions as public health facilities, schools, storage buildings for tree nursery or research equipment, facilities for ecotourism and field research in protected areas, enclosed latrines, and such small-enterprise developments as manufacturing, logging mills, and furniture carpentry shops. Other requirements can include access roads; well digging; land grading, clearing, or leveling; and paving of land surfaces, as well as storage and transport of construction materials. Construction camps, campground and trail establishment, and visitor centers may also be needed. Finally, construction of small dams or reservoirs is common in development projects.*

Potential Environmental Impacts

Preparation of a construction site may require the clearing of vegetation and use of off-road vehicles. Use of local materials can reduce their availability for other purposes. For example, the use of cement or timber can result in local scarcity and inflated prices.

Water Resources

- changes in hydrology, which may result in increased erosion, siltation, flooding, or reduced water availability;
- reduction in water quality and availability to downstream resource users;
- degradation of wetlands, fisheries, and wildlife habitat;
- socioeconomic and human health consequences from an increase in disease vectors, dust and exposure to hazardous materials; and
- increase in disease-carrying vectors resulting from the creation of borrow/fill areas. (Water pits associated with and resulting from construction can contaminate the water table and provide a habitat for disease-carrying insects. Increased water runoff with elevated suspended-solid contents can disrupt local drainage patterns, pollute the water supply, and increase erosion.)

Soil Fertility

- increased soil erosion; and
- reduction in soil fertility and agricultural productivity.

Vegetative and Wildlife Resources

- loss of vegetation from land clearing; and
- loss of wildlife habitat, fisheries, and associated biodiversity.

Labor

- potential reduction in the available labor for agriculture activities (although the use of local labor can provide important income and other benefits to local communities, if properly assessed and managed);
- social conflicts between existing communities and immigrants in search of employment or new agricultural land;
- increased vehicle use and air pollution, noise, and vibration associated with transport of workers and construction materials and use of construction equipment;
- sanitation problems;
- increased game hunting and wood cutting; and
- establishment of unregulated squatter camps.

* Dam construction requires a special level of review under USAID's environmental procedures and usually invokes a "positive determination."

Causes of Negative Environmental Impacts

Construction activities must be planned carefully to prevent negative environmental consequences. Activities that do not consider resource conservation polices, appropriate site selection, appropriate technology, and socioeconomic factors are likely to degrade the environment.

Poorly planned road development, hotels, and irrigation can have severe effects. Water resources are particularly vulnerable to construction activities. For this reason, wetlands associated with coastal shorelines and river floodplains merit special attention.

Removal of topsoil and soil compaction often constitute serious environmental impacts, with loss of soil fertility and soil drainage capability. Mechanical, not human, manipulation of soil has severe results. Extent of soil damage can be reduced if mechanical equipment is carefully selected and operated.

Key Questions for Construction

- How are the resources on the site presently being used by local resource users? How would the proposed construction activity increase or reduce the community's benefits associated with the site?
- If the site is relatively undisturbed, is there an alternative disturbed site that could be developed?
- How will the proposed construction activity complement or conflict with regional planning and policies?
- What construction techniques and tools can be used to minimize potential negative environmental impacts?

Suggested Actions

Assess National Planning Context. Determine if the proposed activity is consistent with national forest management plans and policies. Determine if and where reforestation and soil protection measures are needed.

Ensure Local Participation. Involve local government agencies and local communities. If they become aware of potential problems early, they will be better prepared to assist in mitigation and monitoring.

Select an Appropriate Site. Determine if the proposed construction site contains biological or socioeconomic resources that could be negatively affected by the construction activity. Identify alternative construction sites where the land is not being used or is already degraded.

Determine Raw Materials Required. Construction activities in a rural setting are usually dependent on the immediate surroundings for raw materials (e.g., clay, stone, or construction wood) and fuelwood. Extraction of raw materials required by the industry should be assessed for its direct and indirect environmental impacts.

Monitor Impacts. Develop a plan during the project design phase to monitor environmental impacts associated with the industrial activity (e.g., chemical discharges, erosion, and loss of vegetation). Early in the project design phase, set aside financial resources for

3.15 WASTE MANAGEMENT

Problem Identification

Uncontrolled industrial and municipal waste associated with rapid urbanization—mostly due to population migration from rural areas to cities—is threatening human health and natural resources within urban and surrounding rural communities. This threat is becoming increasingly serious across Africa.

The negative impact of urbanization can mainly be attributed to inadequate management of: 1) industrial hazardous waste and chemical byproducts; 2) municipal and household liquid and solid waste; 3) biohazardous/infectious waste; and 4) physical ac-

tivities such as excavation—mining, sand digging, road construction borrow pits, etc. Pollutants that are released into the environment find their way through different pathways to sensitive ecological endpoints such as groundwater, wells, irrigation sources, streams, rivers and lakes. Thus, urban pollution can significantly affect the surrounding rural communities as well.

Waste generated in towns and cities fall into three major categories:

- *Hazardous Waste*. Because of its quantity, concentration, and physical, chemical, or infectious characteristics, hazardous waste can cause or significantly contribute to an increase in illness and death or may pose a substantial threat to human health or the environment when inadequately treated, stored, transported, disposed, or managed.
- *Nonhazardous Waste*. Classification includes household trash, industrial and commercial waste materials, which may not pose immediate or direct harm to human health and the environment.
- *Infectious/Biohazardous Waste*. This waste is capable of spreading infectious disease, and has become an issue especially for HIV/AIDS-contaminated materials. Such waste includes: cultures and stocks of infectious agents and associated biologicals; pathological waste; contaminated glass; contaminated animal carcasses, body parts and bedding; and isolation waste generated by hospitalized patients with communicable disease.

The primary sources of hazardous waste, increasingly so as economies grow, are:

- small to medium-sized industries and commercial enterprises;
- households (e.g., pest control or household cleaning products);
- large manufacturing sectors such as mining, chemical, textiles, rubber, plastics, petroleum, food processing, paper, printing and construction;
- agricultural activities (e.g., fertilizers, pesticides, pesticide containers); and
- medical/health facilities, especially biohazardous waste.

Although nonhazardous waste may not be toxic, it may contain leachable chemical substances and constituents that can degrade groundwater quality. The mismanagement of urban waste can result in:

- unsightly and smelly waste piles;
- open dumping and public littering (e.g., surface dumping in gullies, dumping in rivers, lakes and coastal waters);
- semicontrolled tipping or crude sanitary landfills;
- open burning;
- uncontrolled air pollution from industries;
- point-source discharge of domestic sewers and industrial effluents;
- untreated industrial and domestic sewage.
- open pit latrines and open uncontrolled municipal toilets and sewerage systems, as significant sources of fecal and pathogenic pollution; and
- nonpoint source discharges.

These waste problems are directly associated with the socioeconomic conditions such as low income and lack of municipal land-use management capacity, including lack of effective waste management planning. Also, lack of technical transfer and support systems undermine implementation of effective urban waste management (treatment, storage and disposal).

Potential Environmental Impacts

The lack of adequate management of urban waste has direct environmental consequences. Air pollution causes illnesses that are difficult to diagnose. Cumulative adverse health impacts affect productivity and place pressure on natural resources. The likelihood of release of hazardous substances and hazardous chemical constituents to the food chain is substantial, due to a lack of well-designed waste management systems. The potential pathways for exposure are through precipitation, evaporation, infiltration, erosion, and breakdown through exposure to sunlight. Furthermore, the following critical ecological components typically are vulnerable to being contaminated and degraded:

- *Groundwater*. Drinking wells and irrigation;
- *Surface Water*. Adjacent and downstream lakes, rivers, wetlands, coastal waters and their aquatic life and fisheries;
- *Surface Soils*. Contamination and poor drainage due to waste piles; leads to erosion and loss of top soil;
- *Air*. Ambient air quality, carbon dioxide sources and global climate change; ozone depletion;
- *Arable Lands.* Periurban gardens and crop land, small-scale residential farms, crops and forest; and
- *Biota.* Species within a biological community, wildlife, sensitive habitat.
- *Humans.* Health affected by unsanitary living conditions; increase in breeding of filth and domestic flies and contaminating bacteria and other pathogens; risk of spread of communicable diseases; increased morbidity and mortality.

Causes of Negative Environmental Impact

Causes of negative impact fall into three categories:

Technical

- lack of a solid waste management System and resources for implementation (treatment, transport, storage and disposal);
- inadequate or obsolete trash removal equipment, unavailability of disposal technology and equipment;
- absence of sewage discharge systems (design, treatment, and disposal);
- shortage of technical (human resource) expertise;
- lack of training and education on technical design approaches; and
- lack of a comprehensive air pollution control strategy.

Environmental Regulation/Enforcement Capacity and Policy

- lack of and/or weakness of environmental regulations;
- inadequate compliance, oversight, and enforcement capacity;
- absence of waste management planning;
- inadequate urban and land-use planning;
- breakdown and/or inadequate urban waste management systems that integrate pollution prevention and waste minimization strategies; and
- lack of attention to waste management at individual site level (industry and household).

Socioeconomic

- lack of financial resources to provide water, sanitation, and waste management services;
- inexperienced government agencies and administrative practices;

- absence of community waste reduction programs, such as recycling and collection programs;
- inadequate waste minimization efforts at industrial, commercial, and manufacturing sectors;
- population growth and density;
- lack of pollution prevention planning in industrial, commercial, and manufacturing development; and
- lack of an alliance between NGOs, government, and industries in capacity building for waste management.

Key Questions For Waste Management

- What are the needs? Characterize and describe waste generated within the community. It is important that information be gathered on waste management to identify problem source areas; it serves as a prerequisite for setting goals and priorities within the framework of a project is design and implementation.
- Is the community concerned about waste management problems? If not, is there a need for community awareness through mass education and public discussion?
- Is there municipal waste management plan or system in place?
- Is there a need for development of regulatory instruments? If so, several variables should be considered, such as ecological and human risk, economic impact, regulative burden, consumer products and industrial byproducts, and overall cost-benefit factors.
- Is there an alliance between the industries, government, and NGOs in identifying and addressing municipal waste issues?

Suggested Actions

NGOs can assume advocacy roles to promote public dialogue and awareness and promote policy change and prioritization. NGOs can also initiate action at the grassroots level, including promoting sound waste management practices in their own projects, such as recycling and composting. A comprehensive agenda for integrating sound waste management practices into all sectoral activities might include the following:

Assess Waste Management Issues Within the Community. Using participatory approaches, investigate waste management practices within a community and surrounding areas and identify the critical environmental issues and management needs. Identify and categorize the waste types likely to be of concern—type of waste, quantity generated, and forms, in relation to significant risks to ecological and public health. Evaluate long-term health, environmental, and economic ramifications of waste impact to the community.

Mount a Community Involvement and Awareness Campaign. Developing an effective community education program increases public awareness, which is important to building consistent and pragmatic community-based environmental management programs. This would include identifying appropriate clean technologies and approaches to reducing the amount of waste generated, as well as to disposing of them in a manner consistent with the assimilative capacity of the environment.

Promote the Development of Regulatory Instruments. Standards are needed for siting, construction, performance, and management. Monitoring should be a routine part of promoting the adherence to technical standards.

Promote Waste Management and Contingency Planning in Development Activities. Integrate sound waste management practices in all sector-related activities. Consider how to promote and develop a Municipal Waste Management System Plan (Figure 3.1) Figure 3.2 illustrates an integrated approach to waste management. A comprehensive municipal waste man-

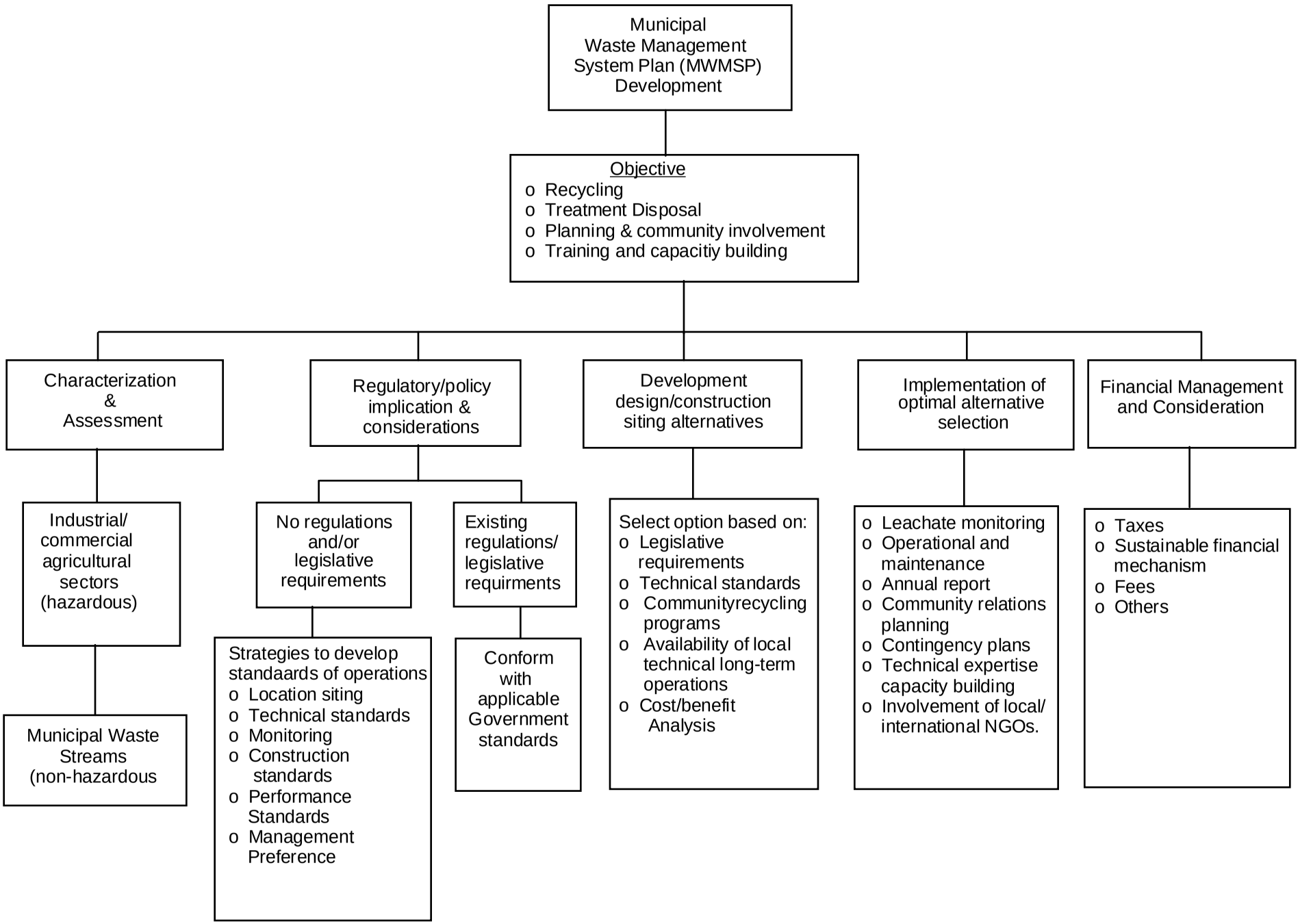
agement strategy will assist regional and national decision makers in promoting collaboration and involvement in the planning process.

Explore Opportunities to Develop Partnerships. It may be appropriate to pursue joint waste management programs with corporations, businesses, and other organizations within the country. Consider the formation of an NGO / industry task force or team to address a mounting waste crisis.

Promote Recycling. Community recycling programs, seeking to recycle wastes to productive uses, have begun successfully introduced in Africa, and, as in Côte d'Ivoire and Benin, these programs could be a special initiative of women's groups.

Seek Other NGO Input. A partnership with international NGOs may be desirable as a source of technical assistance. These NGOs could assist with identifying resources and expertise. An example would be the Network for Environment and Sustainable Development in Africa (NESDA).

Figure 3.1 An Integrated Approach to Municipal Waste Management Planning


Municipal
Waste Management
System Plan (MWMSP)
Development
Objective
o Recycling
o Treatment Disposal
o Planning & community involvement
o Training and capacitiy building
Characterization
&
Assessment
Regulatory/policy
implication &
considerations
Development
design/construction
siting alternatives
Implementation of
optimal alternative
selection
Financial Management
and Consideration
Industrial/
commercial
agricultural
sectors
(hazardous)
Municipal Waste
Streams
(non-hazardous
No regulations
and/or
legislative
requirements
Existing
regulations/
legislative
requirments
Strategies to develop
standaards of operations
o Location siting
o Technical standards
o Monitoring
o Construction
standards
o Performance
Standards
o Management
Preference
Conform
with
applicable
Government
standards
Select option based on:
o Legislative
requirements
o Technical standards
o Communityrecycling
programs
o Availability of local
technical long-term
operations
o Cost/benefit
Analysis
o Leachate monitoring
o Operational and
maintenance
o Annual report
o Community relations
planning
o Contingency plans
o Technical expertise
capacity building
o Involvement of local/
international NGOs.
o Taxes
o Sustainable financial
mechanism
o Fees
o Others

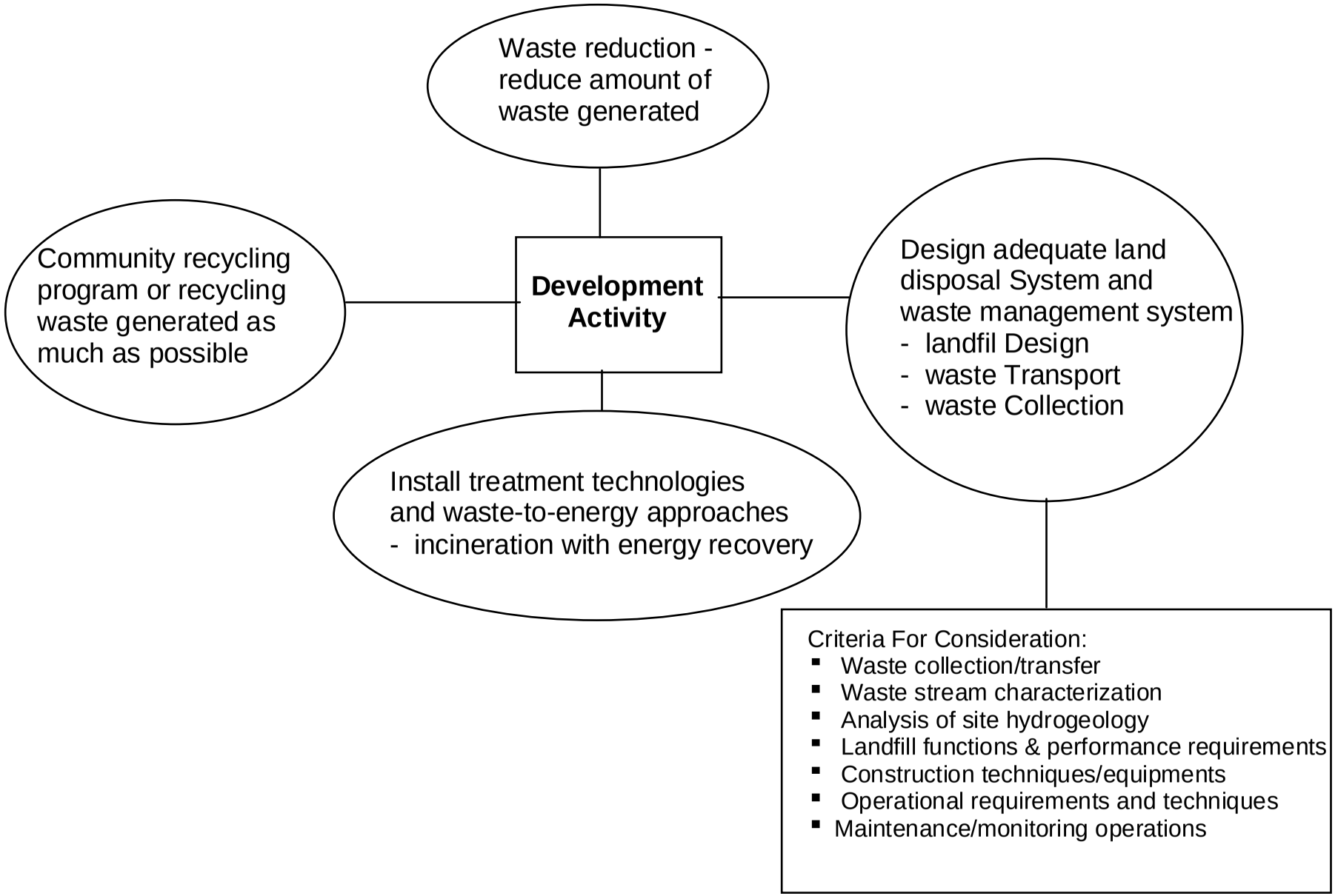

Waste reduction - reduce amount of waste generated
Community recycling program or recycling waste generated as much as possible
Development Activity
Design adequate land disposal System and waste management system
- landfil Design
- waste Transport
- waste Collection
Install treatment technologies and waste-to-energy approaches
- incineration with energy recovery
Criteria For Consideration:
Waste collection/transfer
Waste stream characterization
Analysis of site hydrogeology
Landfill functions & performance requirements
Construction techniques/equipments
Operational requirements and techniques
Maintenance/monitoring operations

Figure 3.2 Aspects of Community-Based Waste Management Planning

3.16 ENVIRONMENTAL MITIGATION DURING REFUGEE RELIEF

Problem Identification

USAID has supported emergency relief to refugees in many African countries. Refugees are normally defined as people who leave their countries to avoid political persecution or physical danger. People who are temporarily displaced within their country may also be referred to as refugees or simply as "internally displaced persons." Some of the causes of population displacement include war and political turmoil, political persecution, natural disasters, and resettlement planned under economic development projects. Improperly managed, refugees can suffer extreme poverty and cause extensive environmental degradation.

Potential Environmental Impacts

Unlike USAID's long-term economic development programs, refugee assistance activities have immediate emergency requirements that may include the provision of food, water, medical care, energy sources, and building materials for shelter. Refugees living temporarily in relief camps can contribute to severe environmental degradation of vegetation, soil, water resources, livestock, and agricultural production. Sanitation and health are also potential problems. Environmental considerations should be built into design and implementation of relief activities.

In addition to the direct environmental impacts, there are indirect effects. These include endangering local game-hunting areas and sources of medicinal plants used by the resident communities, disruption of local markets, pollution and damage to natural water sources, and soil erosion caused by refugee sites that require access via unstable roads.

Causes of Negative Environmental Impacts

The temporary settlement of refugees in another country or region can place stress on the environment, particularly if the number of people and their land-use practices are incompatible with, or beyond the carrying capacity of, the environment. An area's carrying capacity is defined as how much use an area can tolerate before undesirable environmental changes occur. Factors that influence an area's carrying capacity include ecosystem type and its sensitivity to stress and land-use practices conducted in the area.

The initial planning of a refugee relief activity should consider the carrying capacity of the proposed site. Resource planners should be aware of the primary factors that cause environmental degradation in refugee camps. Some of these factors are:

- locating refugee camps in environmentally fragile areas, including areas where fuelwood and construction materials are scarce, inadequate transportation and roads, water resources limited and/or soil has a high erosion potential;
- existing high human and animal population densities in the proposed refugee site;
- absence of incentives to encourage the planned refugee population to maintain the environment (e.g., lack of land tenure or absence of refugee participation in planning); and
- inadequate time to conduct environmental assessment of the proposed refugee camp site due to short-term planning horizons and a greater international focus on the refugees than on the environment and resident communities.

Key Questions for Environmental Mitigation During Refugee Relief

- What are the potential environmental effects of refugees on the proposed refugee camp environment? How can these anticipated environmental impacts be mitigated in advance? What institutional changes are required within international relief organizations for such mitigation to occur?
- Does the country have a regional land-use plan or national strategic framework (e.g.,

NEAP or Tropical Forestry Action Plan)? Does the international community have planning information regarding the relief area?

- What are the pertinent lessons learned from other emergency relief efforts in the region or elsewhere? What are the lessons learned in the region (both locally and in surrounding countries) for each of the environmental interventions being considered (fuelwood, cook stoves, tree planting, etc.)?
- In addition to forest resources, what are the alternative sources of building materials or energy in the relief area? For example, in East Africa, papyrus plants, when chipped and pressed with a binding ingredient, can be used as a source of construction material.

Suggested Actions

Environmental Assessment. Conduct a streamlined, informal environmental assessment of the area to determine its existing land use and carrying capacity. Determine potential maximum refugee population for the area, preferred location(s) for refugee camps, and the natural resource management activities that should be integrated into the relief activity (e.g., fuelwood, improved roads, or water management).

Use aerial photography ground surveys, existing literature, and participatory appraisal approaches if suitable to identify the location, present land use, and potential impact of the refugee population on:

- parks and protected areas;
- water resources (e.g., village watering points, lakes, rivers, potable water supplies, and wetlands);
- erosion-prone slopes and unstable vegetation;
- forest resources (e.g., water catchments, fuelwood areas, and tree plantations), including the availability of forest resources for construction materials to build pit latrines, health facilities, and compounds;
- grasslands, including their availability for livestock grazing and roof thatch;
- agricultural lands; and
- livestock.

Develop an Environmental Strategy. For the long term, develop a policy and strategy that identify how environmental concerns are to be integrated into the agencies' refugee relief activities. The strategy should provide step-by-step procedures for sustainable use of the environment. All important aspects of the environment and relief organizations' operations should be addressed, such as:

- *Ensure Community Participation*. Ensure that both the indigenous and refugee populations are involved in the decision-making process for the use and management of environmental resources. Identify resource users' preferences and policy/cultural conditions necessary for sustainable use. For example, a refugee group that does not have the means to grind maize may take twice as long to cook whole-grain maize as maize flour, requiring additional fuelwood resources.
- *Integrate Environmental Activities Early*. Early in the process, establish latrines and safe sources of water and fuelwood to minimize negative environmental impacts.
- *Identify Energy Resources.* Determine the present sources of energy in the relief area, such as important sources of wood (e.g., forest reserves), and the costs of their transportation to the planned refugee camp. Determine other potential energy sources in the area (e.g., solar cookers or papyrus briquets). In addition, identify where and under what conditions wood stoves or alternative energy sources are being used in the region of the relief area. Use this information to promote use of efficient stoves.
- *Monitor Environmental Impacts*. Establish a simple system to monitor how resources (e.g., fuelwood and water resources) are being used and to monitor environmental changes in the area (e.g., impacts on vegetative cover or agriculture).

- *Assess Policy Conditions Available and Human Resources.* Assess current policy conditions that may affect the success of environmental interventions. In addition, evaluate human resources available to conduct sustainable land use (e.g., via agricultural extension services) (United Nations Humanitarian Coordination Relief 1994).

Box 3.6 Effects of Military Conflicts on Protected Natural Areas

Many of Africa's protected areas are vulnerable to war and political conflicts. During military actions, management of important wildlife and conservation areas is impossible given the dangerous conditions and political instability. Military conflict can also have a positive effect on protected areas. The migration of rural resource users from protected areas to other countries or areas within a country can reduce human pressure on protected-area resources. For example, it was reported that Mozambique's recent civil war may have resulted in an increase of vegetative growth and improved wildlife habitat within a number of newly vacated protected areas (e.g., Ngorongosa National Park). However, the use of wildlife for game meat by military forces occupying some protected areas may have resulted in population reductions in some species (USAID 1993c).

In contrast, massive refugee movements can place severe stress on protected areas. For example, the civil war in Rwanda resulted in severe stress to Zaire's Virunga National Park from immigration of Rwanda's refugee population. The park maintains important populations of the famous and endangered mountain gorilla. At least 850,000 Rwandan refugees were once camped within walking distance of the park, and one refugee camp, Mugunga, is situated within the park's borders. As a result, the refugees' requirements for wood for cooking and construction have begun to deplete the park's resources (African Wildlife 1995). Fortunately, the Zairian Government is encouraging refugees to collect wood in areas at a distance from gorilla habitat (Schally 1995, personal communication). The German Agency for Technical Cooperation (GTZ) is also transporting fuelwood to the camps.

Another potential impact of residency of refugees in or near the park is the spread of disease to gorillas from open disposal of human and livestock waste. There have been reports of wastes being ". . . scattered by animals in search of food, thus posing a significant risk of disease transmission both to animals and humans . . ." (African Wildlife 1995).

3.17 RESETTLEMENT ACTIVITIES AND THE ENVIRONMENT

Problem Identification

The purpose of resettlement activities is to provide residence for displaced populations. Resettlement may be centrally directed and planned, such as resulting from dam construction, or spontaneous (and possibly government-assisted) such as to reoccupy lands evacuated as a result of civil war, or lands freed of onchocerciasis or tsetse fly. Transportation, temporary shelter, and technical assistance may be provided to resettling people to help the process. Ideally, resettlement activities assist populations to reestablish residence and productive employment without causing negative environmental impacts. However, government-directed resettlement is, nonetheless, an activity requiring a "positive determination," (see Section 5.)

Potential Environmental Impacts

Improperly managed settlement activities can cause deforestation, clearing of new lands, pollution of water resources, and destruction of wildlife habitat. Resettlement activities most often assessed for their potential direct environmental effects include repair of roads and related infrastructure, land clearing, water-supply and sanitation projects, the renovation or reconstruction of facilities, and agricultural input supply and use.

Causes of Negative Environmental Impacts

Negative environmental consequences are more likely when short-term emergency relief and long-term development activities are not concurrent. Short-term resettlement activities are of little use if communities are not provided assistance to rebuild their capabilities to become self-sufficient. Without self-sufficiency, the beneficiaries may become overdependent on donor assistance.

Project planners should assess the impacts of projects individually, in conjunction with other activities, and cumulatively over time. Other issues can arise as well. For example, if there is a high level of investment in food security through food aid, the link between food security and natural resource management should be scrutinized.

Key Questions for Resettlement Activities

- What are the alternatives for location of resettlement areas and temporary camps?
- What are the potential environmental effects of displaced people on the proposed resettlement areas or temporary camps? How can environmental impacts be mitigated beforehand?
- What are the potential socioeconomic impacts of each proposed resettlement site on resident host communities?
- What is the land-tenure system in the country or region, and how will it affect displaced populations?
- Is vegetative resources expected to improve or be degraded as a result of resettlement activities? What existing land-use planning and interventions can be implemented to counteract land degradation?

Suggested Actions

Emphasize Self-Sufficiency. Reduce risks of dependency, through the provision of both emergency relief and long-term assistance. NGOs should emphasize economic and institution-building activities rather than strictly humanitarian activities. For example, to minimize the creation of dependency of beneficiaries, NGOs should focus on providing specific interventions during the resettlement process rather than sustained assistance over many years. NGOs should assist government extension services in resolving zoning and other land-tenure issues, as well as in developing natural resources management strategies. Planners should also work closely with community land-management groups and other local associations in this process.

Provide Environmentally Sound Technical Assistance. In providing technical assistance, avoid measures likely to pose environmental risks. For example, pesticides should not be included in short-term technical assistance packages, and their use should not be subsidized. Once emergency assistance is provided, however, long-term development projects may consider the use of pesticides (preferably in the context of IPM). (See Section 3.12.)

Other agricultural production inputs (e.g., seeds, tools, and fertilizer) should be selected with care, and potential environmental impacts taken into consideration and monitored. Some examples of potential environmental impacts associated with production inputs include water contamination or soil salinization, resulting from the improper use of fertilizers; and human and wildlife health hazards, resulting from improper use of pesticides.

In addition, assisting communities to become self-sufficient should be given priority over training communities to use complex technologies.

Assess Potential Environmental Impacts. As part of resettlement projects, assess the potential environmental impacts of implementation activities, individually and cumulatively, over time.

Box 3.7 Resettlement Lessons

The following are some lessons learned from resettlement experiences worldwide. They should be considered in regard to programs that address reintegration and rehabilitation of populations.

- Promote spontaneous NGO and government-assisted settlement, as opposed to government-directed settlement.
- Promote rain-fed as opposed to irrigation-dependent agricultural practices at settlements.
- Encourage diversified production systems at the household and community levels that combine cropping systems, livestock management, and a range of nonfarm activities, as opposed to a narrow emphasis on farming systems.
- Integrate host communities with settlers and pastoralists through land management associations that provide security of tenure and a foundation for management of the natural resources base.
- Promote zoning of community-managed lands for village sites, cropping systems, livestock, forests, and other natural resources.
- Give priority to development of less-isolated areas that spontaneous settlers prefer as opposed to remote areas having poor access to roads, services, and markets.
- Use existing government agencies for planning and implementation purposes instead of establishing special settlement agencies.
- Actively involve local organizations at district, subdistrict, and community levels, and PVO/NGO community, in promotion of diverse, participatory options.

Source: McMillan, et al., 1990.

3.18 FOOD AID, HUMANITARIAN RELIEF, AND THE ENVIRONMENT

Problem Identification

Providing food aid to needy beneficiaries is an important humanitarian objective of the development community. The United States has long placed a priority upon ensuring adequate levels of food security. For example, U.S. Congressional appropriations for food and agricultural commodity assistance (PL-480) are roughly $1.5 billion per year.

Food-aid programs take many forms, from short-term emergency relief to longer-term cash- or food-for-work activities. Food-aid recipients can receive both monetary and food payments, which allow people to do constructive work that people cannot do without external support. Food-for-work activities often involve long-term interventions such as soil conservation or road rehabilitation. Emergency relief and long-term development are logically seen as forming a continuum in which disaster assistance can lead to economic development.

Food-aid programs can be effective in relief of famine, if they are targeted carefully. There may, however, be indirect positive or negative impacts

from food aid, such as a change in beneficiary attitudes, motivations, and economies. These changes may allow or cause people to adopt or abandon more sustainable environmental practices.

In areas where the natural environment is inherently fragile, such as in the Sahel, recurrent natural disasters, combined with steady population growth, overuse and misuse of natural resources for agricultural and livestock production, produces social and environmental crises. These crises can lead peoples' coping strategies to exacerbate environmental degradation, e.g., cutting firewood to generate income when crops fail, thus increasing deforestation and erosion. Disaster assistance is needed that includes sustainable natural resources management as a disaster-relief intervention and that has both immediate and long-term benefits.

Causes of Negative Environmental Impacts

Food-aid programs can also lead to negative environmental impacts if program beneficiaries become dependent on the program. Potential negative environmental changes include:

- resource-user shifts in crop and livestock production strategies;
- changes in fuelwood gathering and use patterns, potentially leading to over exploitation of available resources;
- adjustments in seasonal and long-term migration and livestock grazing patterns;
- changes in land management institutions, such as land tenure and grazing regulations, which could negatively affect how a community interacts with its physical environment; and
- reduced local production of seed.

Because of the possible negative effects of food-aid programs, they should be designed to reduce the risk of dependency. All links between food aid and sustainable natural resource management should be examined and monitored during program implementation.

Key Questions for Food Aid

- Do the proposed interventions reflect community participation in choosing appropriate, short-term relief options (even when crises require quick donor action)?
- Will the security of long-term food supplies and the physical environment be best served by food aid or by another type of development activity?
- Is program food aid necessary for the development of natural resource management in the host country or for the development of the country being assisted?
- What are the costs and benefits of this food aid?
- Are there more cost-effective ways to achieve development?

Suggested Actions

- Understand the local cultural and socioeconomic context, because it is essential for implementing successful interventions; the technical aspects of the interventions are generally easier to modify than their socioeconomic aspects;
- Examine links between food aid and sustainable natural resource management prior to, and monitor it during, intervention;
- Ensure that the flow of food resources into a region and the mechanisms put into place to support that flow improve the beneficiaries' food security and economic strength.
- Ensure that efforts to mitigate famine also protect the environment but not at the expense of undermining the long-term food security and resource management of the beneficiaries.
- Include activities oriented towards sustainable natural resource management, such as microcatchment water harvesting techniques for crop and range lands; channel plugs for erosion control; native seed collection for revegetation; and women's communal dry-season gardens (See USAID OFDA/FMA 1994).

While potentially a useful tool for integrating relief and development, food aid may not be an ideal mode of implementation. Planners need to consider carefully if long-term sustainability of local communities is best served by food aid or by other development activities.

Box 3.8 Sudan: A Link between Food Aid and Civil War

Sudan has been wracked by civil war between the government and rebel forces in the south for decades. Conflict, drought, and flooding have devastated the civilian population. While the international donor community's response with food aid has saved thousands of lives, it has had the harmful effect of perpetuating the conflict.

All the warring parties have used food as a weapon to garner the support of the population. Evidence suggests the availability of relief food has consolidated the hold of the various forces over their respective populations by alleviating the conditions of civilians on all sides. It has eased the billigerents' own need to provide such food or to foster conditions in which food could be produced locally. It has allowed them to continue disrupting agriculture and livestock-raising and helped them prepare for new rounds of combat.

Such insidious impacts qualify the positive results of saving lives associated with relief operations. While the Sudan may be an extreme case, it highlights the potential pitfalls that food aid can create.

Source: Food Forum, February 1993.

Box 3.9 Linking Relief and Development: Principles and Operational Guidelines

A new concept about the relation between disaster assistance and economic development is taking hold in the development community. No longer are the two areas seen as distinct. With appropriate planning, emergency relief activities are being recognized as potentially having long-term economic benefits, complementing sustainable development. Likewise, transitions between relief and development occur in the other direction: strong development provides resilience to, and helps prevent, disasters.

In 1995, a U.S. government interagency working group on rapid transitions from relief to development, distilled some basic principles and operational guidelines, intended to be simple, universal and comprehensive:

Principle I. Strategic Coordination: Effective transitions between relief and development depend on strong linkages among relief, development, political and military partners.

- Integrated planning across agencies and coordinated implementation of activities among agencies within a government are crucial to linking relief and development effectively.
- Strategic coordination among governments and other partners at the planning and implementing stages are also critical to linking relief and development.
- Local and national governments, communities (including disaster survivors), and other host country partners should participate in the design and implementation of disaster relief and development programs.
- Integrated planning and strategic coordination processes should maximize the comparative advantages of each and the combined advantages of all partners.
- For countries in crisis, transition strategy planning should be undertaken at the earliest possible moment.

Principle II. Relief for Development: Relief programs should reinforce development objective. Relief programs should:

- reflect the particular characteristics of the disaster faced;
- use decentralized strategies whenever possible
- involve disaster survivors in the decision-making process;
- identify and build capacities and address vulnerabilities;
- sustain livelihoods while saving lives; and
- build on local and national institutions, communities, and networks.

Principle III. Development for Disaster Prevention: Programs should be designed so that the effects of disasters (natural or human-caused) do not undermine the development progress of countries.

Prevention programs should:

- identify the vulnerabilities (natural and human) of countries and groups within countries;
- address root causes of disaster vulnerabilities, recognizing the possibility that a society can regress; and
- incorporate disaster preparedness into development objectives.

USAID. 1996.

4. Monitoring and Evaluation

USAID is giving increased emphasis to monitoring and evaluation (M&E). Recent policy developed as part of the Agency's reengineering effort indicates that the purpose of monitoring and evaluation is to:

- know whether the assistance packages managed are achieving their objectives and meeting the needs of intended customers;
- understand why the assistance is or is not achieving intended results; and
- use such knowledge or understanding to improve the performance or effectiveness of that assistance.

The overall rationale for monitoring and evaluation applies to all assistance the Agency funds. In the reengineered USAID, monitoring and evaluation play a important role. The Agency requires assurance that performance data be collected and used to monitor regularly, analyze, review, and assess performance to:

- inform management decisions aimed at achieving intermediate results and strategic objectives, and overall Agency objectives;
- meet reporting and accountability requirements at all levels of the Agency; and
- enhance organizational learning.

The following sections provide details about monitoring and evaluation needs as they relate to PVO/NGO activities in environment and natural resource grants.

Why Monitor?

Projects are monitored to confirm that a project investment is resulting in the anticipated benefits and to decide whether there are other unintended effects. Monitoring must be viewed as a dynamic process and is a key component of successful implementation. Monitoring will confirm whether a project design is correct, whether the project-induced changes are resulting in anticipated benefits, and whether there are unanticipated changes resulting in adverse effects that require prompt mitigation.

All projects are designed with some hypotheses. If A is changed, B will change; if fertilizer is available, there will be higher yields. If an increase in fertilizer does not result in increased yields, then either the project design is not correct or conditions have changed, and the project design must be changed. Careful and timely monitoring will provide the basis for project redesign and will help projects meet their goals, even when the original design was faulty or when changing conditions require a new approach.

Why Evaluate?

Data collected in monitoring can also be used to evaluate whether a project has met its goals (e.g., have yields doubled or has the availability of fertilizer resulted in increased soil erosion by encouraging planting on marginal lands?) In evaluating a project, managers must have data reflecting the conditions at the start of the project and on changes, anticipated and unanticipated, that have resulted from project activities.

Since many changes cannot be measured directly, indicators that serve as proxies for the effects must be selected. While it is important that the indicators selected confirm whether there are changes in the targeted conditions that the project is intended to effect, it is also important that other indicators be selected to judge whether there have been any unintended results.

This section provides guidance on the ways to monitor, on how to use monitoring results to change implementation plans when hypotheses are false, and to evaluate a project's overall effect.

A good project design requires a good M&E plan, whose potential costs far outweigh the additional expense. Without an effective monitoring plan, projects can be completed where the negative impacts outweigh the benefits. Monitoring, therefore, is one requirement of an effective and environmentally sound project. As in all USAID projects, NGOs are responsible for integrating monitoring and evaluation plans into their concept papers and proposals.

Grant Manager Responsibilities

While NGOs are responsible for preparing appropriate monitoring plans, the USAID grant manager must ensure that the M&E plans are well prepared and appropriately funded. Conditions vary widely, but 1 to 5 percent of total project cost is usually required for an effective M&E program. The USAID grant manager should ensure that NGOs:

- include sufficient funding in budgets for staff monitoring activities;
- standardize NGO field methods countrywide, if not regionally;
- derive lessons learned from the evaluation of both positive and negative environmental impacts nationally and regionally (e.g., NGO workshops); and
- show how environmental monitoring and evaluation concerns are integrated into the project design.

Using line items in grants for the monitoring and evaluation of environmental impacts will ensure that NGOs have resources specifically designated for these tasks. M&E components of grants were, in the past, sometimes given low priority in the absence of specific budget support for other than midterm and end-of-project evaluation.

Reengineering emphasizes that monitoring and evaluation are key component of the Agency program. USAID grant managers should also be aware of emphasis on monitoring and evaluation and should be prepared to require and to fund monitoring and evaluation of all grants.

Who Monitors? Who Evaluates?

It is the responsibility of the NGO or PVO to incorporate environmental monitoring and evaluation in its grants. While the responsibility resides with the PVO or NGO, the grantee may not have the inclination or expertise to conduct the monitoring and evaluation. Many contractors, however, specialize in monitoring and evaluation. In identifying possible contractors, the PVO or NGO should consider the host government.

Providing resources to national government agencies will help to build capacity to undertake future monitoring and evaluation and other NGO and donor activities. Since governments will ultimately be responsible for monitoring and evaluating programs within their countries, building such capacity serves an important development goal.

Considering the importance of the host government's capacity to monitor and evaluate projects, USAID should consider encouraging PVO and NGOs to divert monitoring and evaluation activities to host-country institutions. Coordination between a USAID mission and the host country for the collection and analysis of data is consistent with the Foreign Assistance Act. Whether done by the grantee or contracted out, the grantee is responsible for timely and appropriate monitoring and for redesign of activities based on the results of the monitoring.

Monitoring and Evaluation as a Useful Tool

M&E plans are a necessary tool for project managers and must be part of a project's design. Where applicable and to the extent possible, such plans should develop standard data requirements. Standard data

will provide archives of the effects of interventions at different sites and times.

Archives of impacts collected and analyzed uniformly can provide important lessons on the component leading to project success or failure. Such information will allow project managers to plan interventions more carefully. While standardization is desirable, it should not be the controlling factor in the design of a monitoring system.

Monitoring and evaluation is an important tool in project success. All projects are designed with assumptions of factors that will lead to success. Such hypotheses will include assumptions on the adoption of interventions and the effect of the adoption. Monitoring and evaluation will test both assumptions. Failure of either the adoption of the practices or the impact of the intervention should lead to immediate adjustments to affect either or both adoption and the type of intervention.

The process of continuously adjusting the plan based on the collection of information is often called “adaptive management" or "dynamic implementation.” A well-designed M&E system can give project managers the necessary information for adaptive management to be effective.

Designing an Impact Monitoring System

Here are some suggested steps for the development of a monitoring and evaluation system (not all these steps may apply to every project or activity):

- Determine the reason for the monitoring.
- Gather and integrate existing data (consider methods of data storage and analysis).
- Establish “baseline conditions.”
- Identify “hot spots” and ecosystems at high risk (this is more appropriate for ICDPs).
- Formulate specific questions to be answered by monitoring.
- Select indicators.
- Identify control areas and treatments, if necessary.
- Design and implement a sampling scheme.
- Validate relation between indicators and intermediate goals.
- Analyze trends and recommend management actions.

Sample objectives for a monitoring and evaluation system include the following:

- Tracking progress, identifying problems and opportunities, and making modifications.
- Monitoring the measurable effects of rural development activities.
- Identifying lessons learned for adaptive management.
- Testing assumptions and verifying linkages between conservation and development.

ICDPs, in particular, need to integrate better M&E systems. Many new approaches being used in these projects are untested. A 1992 evaluation of ICDPs showed that few projects have established systems to monitor and evaluate the effects of project activities on local peoples living near protected areas or changes in the biotic communities within protected areas .

Assessing change as a result of project activities requires knowledge of conditions that existed before the project. A project baseline, containing both socioeconomic and biological data, is essential for a M&E plan. Without this information, project managers cannot gauge the successes or failures of their actions within and outside the protected areas.

Many NGOs have their own M&E programs and trained specialists. Those that do not may wish to consult the many treatises on methods for monitoring and evaluation or use evaluation specialists. All NGOs are encouraged to have plans reviewed or to seek technical advice on sampling methods and associated statistical analysis.

Participatory Approach to Monitoring and Evaluation

An important feature of a M&E program is field testing the design. Plans that involve persons living in the area and affected by project activities can provide a pool of interested and involved cadre to gather the monitoring data. Involving local residents is often a cost-efficient method of gathering data and can enhance the project's long-term sustainability.

The World Wildlife Fund suggests the following steps as a guide for developing and field testing a plan for gathering data:

- Review socioeconomic and biological survey methods currently being used in Africa. These include a review of the use of remote-sensing and geographical information systems.
- Hold a workshop with project participants to develop a consensus on the baseline data that should be collected and by whom over time.
- Use pilot monitoring activities on the project site.

The approach described above encourages project participants to take part in deciding when and how to evaluate, what methods to use, how information is to be collected and analyzed, and how monitoring and evaluation results will be used (World Wildlife Fund 1994).

The World Wildlife Fund suggests the following guidelines for developing a participatory M&E system:

- Such activities should be implemented by a team of people, including project staff and representatives of interest groups who are involved in the activity.
- Information should be gathered that is used directly for testing the project's hypotheses and achieving its objectives.
- Information should be gathered routinely as part of project implementation.
- Community members (e.g., extension workers, guides, and scouts) should be trained and compensated to collecy and analyze data.

The participatory character of the World Wildlife Fund's M&E process helps to produce information that is both accurate and comprehensible by the users. The participatory process can provide the necessary information for modifying projects quickly. Because participants gathered the data, both they and the project managers can understand how a project is progressing and can more readily accept implementation changes when needed. Like participatory design and implementation, participatory monitoring and evaluation strengthens participants' skills, promotes autonomy, and fosters the activity's long-term sustainability.

Selection of Measurable Impact Indicators

Impact indicators are developed to show measurable project results and development process for each implementation activity.

Many USAID missions are interested in integrating appropriate impact monitoring into their NGO-supported activities. It is suggested that the indicators selected:

- be grounded in both accepted practice and substantive theory.
- be specific and sufficiently sensitive to reveal those changes in the activity being measured that can be attributed to USAID.
- permit verification of measurement accuracy, reliability, and thoroughness; the indicators allow, at least in principle, for others to replicate the process used to develop them to check on measurement quality.
- promote timely measurement of project and program accomplishments.
- wherever possible and appropriate, focus on people-level impacts; indicators of project

process and outcome are also essential because they tell what was done to achieve a strategic objective; valid indicators of people impact tell how the project affected the lives of intended to beneficiaries.

- have significance for a wide range of audiences, including local managers and external evaluators.
- where feasible, involve local people in data collection; this means indicators should focus on practical aspects, be straightforward, and deal with issues that are meaningful to rural people.
- enable cost-effective measurement, preferably using data in the USAID mission project or program M&E systems or secondary data collected regularly by a host government or donor agency.

5. Environmental Assessment Principles and Procedures

5.1 PRINCIPLES OF ENVIRONMENTAL IMPACT ASSESSMENT

This section outlines a generic model of the steps in environmental assessment. It provides a framework for NGOs or other groups to evaluate the possible impact of their ideas, project proposals and activities on the environment, and to help them determine if the activities will enhance overall sustainability. This section is meant as a guide only and can be adapted to individual circumstances.

Though the actual process undertaken will vary according to each occasion, this model forms a foundation for sound environmental management by rooting itself in local participation. An assessment worksheet meant to spur discussion of planning elements and key issues of grass-roots participation in project design can be found at the end of this section. Assessment of a community's strengths and needs should be discussed before considering specific sector guidelines, just as they need to be when setting goals.

Assessing and Mitigating the Environmental Impact of Small Projects *

Facilitating the Assessment Process

There are many ways to assess the impact of existing or proposed projects and programs. A few guidelines and key questions, however, can be helpful.

- *Do we respect and use local knowledge?* In planning and implementing a project, are we committed to a participatory process that will include people's knowledge of the environment? In bringing people together to understand and work on solutions to their problems, do we have research and education tools that the people can use to understand and express their environmental knowledge?
- *What is the present situation?* At the beginning of the project process, when people are discussing their problems and trying to determine their priority needs, it is important to include research and discussion of the local environment: how much people depend on it and what is or is not being done to improve or protect environmental quality.
- *What do we need to know?* What information is needed to clarify the present situation and to decide what direction to take in the project, which will minimize negative impacts on the environment and, where possible, improve environmental conditions?
- *What are the alternatives?* Before implementing the project, what are the available options and innovations to help reduce the negative environmental impacts and to improve the environmental quality?
- *How will monitoring be done?* What aspects will be monitored during implementation of the project to detect unexpected environmental consequences? Can we monitor in such a way that possible or unforeseen negative impacts can be handled before they become serious or irreparable?
- *Can we manage for sustainability?* Is the organization able to manage the ongoing need for environmental maintenance and improvement, (e.g., waste disposal, replanting, cleaning of canals)? Is the organization open to exploring new local technologies that will improve the environmental quality?

* Adapted from Stuart (1991) and Canadian Council for International Cooperation (CCIC 1990).

Community Environment and Resources Survey

With respect to sustainability, the concern is to avoid project actions that destroy or damage the resources needed for future generations to live. More positively, we should be trying to improve environmental conditions so that our children will have a better life. To do this, we need to look carefully at what we are doing before starting a project or program.

At the planning stage the people you are working with can look at different aspects of their environment:

- The social and community environment rules, laws, customs, economy, history and cultures relations of power: class, caste, gender, ethnicity.
- The "constructed" environment: where people live; the buildings: public, private, commercial (shops), industrial, location, size and type; transport and communication: mail, phones, roads, paths, frequency and type of use.
- The biological environment: the plants, trees, crops, weeds, wild and planted ground cover, fish ponds, wetlands; animals: domestic, wild, where they graze, insects, birds; fish: freshwater, marine.
- Air and water: frequency and amount of rainfall where water is located: fresh or salt, boreholes, surface wells, canals, catchments, tanks, etc.; water quality: drinkable, for animals, polluted; water availability and accessibility; air quality: smoke (grass fires), household cooking smoke, industrial pollutants.
- The land and soil environment: high and lowlands (topography), steepness; soil type and quality; erosion patterns; minerals and rocks.

One way to get environmental data at the project planning stage is to conduct a village or community environment and resources survey using tools that the people themselves can learn. These tools are part of a participatory research process known as participatory rapid appraisal(PRA). And where can people get additional information on conducting PRAs?

Maps or diagrams drawn by community members on the ground, on a wall, or on paper have become key tools for making and recording observations. A map can show for example, where water supplies are available; another could show fields and crops; yet another could indicate where, for what purpose, and how frequently women travel to the market or to gather fuelwood. It is in the participatory process of drawing these maps that the people express their own knowledge and history.

Anticipating Activity Impact

Participants begin to define their problems and the objectives they will try to achieve to overcome them in the planning stage in project or program development. If a good environmental survey is done, alternative ways of achieving the objectives can be explored, ways that will at least minimize environmental damage and, hopefully, improve the environment. The key questions to ask are these:

- What impact can we anticipate from this project on future generations of people, animals, and plants, and on the future supply and quality of land (including minerals) air and water?
- How can we reduce undesirable impacts and enhance the positive impacts?

In asking these questions we assume there is a "circle of interdependence" in which changes in any aspect of the environment will cause changes in each of the other aspects. The changes can be positive or beneficial or be negative and destructive.

It is for participants in a project, using their own knowledge, and where appropriate, the knowledge of "experts", to make decisions about project objectives and methods of implementation that will be beneficial to the environment. The final decision about whether a negative impact is significant is a value judgment. A negative impact can be assumed to be unacceptable if it can be avoided by project redesign, redefinition or relocation.

Box 5.1 Considering Indirect Effects

Indirect effects result two, three, or four steps away from direct impacts and are sometimes identifiable only in hindsight. Nevertheless, good planning follows the chain of project impacts as far as experience permits, and this can be several steps removed from the project itself. For instance, agricultural runoff frequently consists of moderately enriched water, due to farmers' use of fertilizer. Receiving streams become enriched (the primary impact), and this promotes the growth of aquatic weeds (the secondary impact). The vegetation tends to support denser populations of aquatic snails (tertiary impact), some of which are vectors for schistosomiasis. The fourth impact is the increase in the prevalence and intensity of schistosomiasis in the local population. The chain is not this simple, branching out in other directions as well to involve other factors along its sequence. While hindsight will often show unforeseen impacts, the key is to look ahead and to use the technical expertise available to take precautions and mitigate all adverse environmental impacts possible.

Source: Adapted from Harza Engineering 1980.

In general, an impact is **negative** if it:

- reduces biological diversity (the number of local species of trees, ground cover, grasses, seeds, fish, etc.);
- uses nonrenewable energy and resources (petroleum, minerals, metals) where renewable resources (wood. solar energy, small-scale hydro) are available and can in fact be used and renewed within local means;
- destroys or reduces soil fertility; and/or
- contaminates water or air.

The impact is **positive** if it:

- maintains or increases biological diversity (the number of species of trees, bushes, seeds, insects, fish, etc.);
- uses locally available renewable resources, which can be and are replaced within local means;
- maintains or improves soil fertility and the organic composition of the soil; and/or
- improves the quality of air and water.

USAID does not encourage the balancing of benefits against risks with the aim of justifying a project's negative impacts when the positive impacts are perceived to be greater. In contrast, the purpose of an environmental assessment is to provide decisionmakers with a full discussion of significant environmental effects of a proposed action. It includes alternatives that would avoid or minimize adverse effects or enhance the environmental quality so that the expected benefits of development objectives can be weighed against any adverse impacts on the human environment.

Use of Checklists to Determine Environmental Impact and Mitigation Measures

These guidelines recommend the use of checklists in various forms. The use of a detailed checklist is one method of assessing the possible impact of a project on the environment. They are adjunct to, not a substitute for, a proper environmental assessment or review.

Checklists are useful guides in a participatory process of discussion with project participants. They can be developed and used in direct observation or mapping during walking surveys, in community discussion groups, in group interviews, and in discussion with officials and outside experts. Checklists should always be developed and used with the people in the community, respecting and incorporating their local knowledge.

Consider Environmental Mitigation Approaches

We want to anticipate, prevent if possible, and mitigate or lessen adverse impacts, if and when necessary. These impacts may be direct or indirect. Mitigation requires the effective application of information (gained through the monitoring and evaluation process) to the planning and implementation of timely, appropriate, and effective corrective adjustments and improvements in program activities.

Mitigation can take many forms. As understood in these guidelines, there are at least four types of environmental mitigation:

1. Measures taken in **response to regulatory requirements**, designed to address potential direct and often poorly known indirect harmful impacts, by mandating expert guidance in improved program planning and implementation. Examples include USAID's required procedures for Initial environmental examinations, more formal environmental assessments or programmatic environmental Assessments. Similarly, such informal environmental reviews and assessments as advocated in these guidelines are in this category.
2. Steps taken to **reduce or eliminate adverse impacts when detected** during the course of implementation. This implies that a monitoring and assessment process is in place to capture lessons and identify adverse impacts, and that the activity is sufficiently flexible to be adjusted.
3. Steps to **anticipate and ameliorate the potential consequences** of activities that can be reasonably foreseen to result in some negative environmental effects. Examples would include capacity building and training initiatives and the provision of technical assistance and research support for the development and promotion of improved crop production packages.
4. Attempts to **address root causes** of the perceived impact rather than simply treating the impacts themselves. This approach is more fundamental and seeks more sustainable solutions to resource management and conservation through a better understanding of the causal factors underlying decisions regarding resource use and abuse. The approach seeks to promote sustainable societies through appropriate intersectoral economic and governance interventions and often involves the introduction of market-based incentives. Alleviation of rural poverty is seen to be an important component of any environmental or natural resources strategy. This approach is embodied in the "*nexus*" concept which seeks to "understand causal relationships and dynamic linkages in program objectives over time," and is the subject of a recently emerging body of analysis and thought (Cleaver and Schreiber 1994; Shaikh, et al. 1995).

An Outline of the Assessment Process

The environmental assessment process can be divided into discrete activities (also see the Assessment Worksheet in Box 5.2):

1. *Defining Roles*: one must decide how to divide the responsibilities of the assessment process: who will gather information, who will participate in monitoring and mitigation. The local community is an essential player and should be delegated its role and responsibilities in ensuring a project's success.
2. *Scoping to Identify Significant Issues and Information Sources*: To collect information regarding the conditions and the past experiences of the project site and its community.
3. *Reviewing and Collecting Additional Data*: One must determine what information is needed to choose alternative activities that prevent adverse impacts. The focus is on problematic items identified during the scoping process. In order to later monitor and evaluate the impacts of activities, one needs to have points of reference with which to measure their effects. This goes for measuring success as well.
4. *Determining the Environmental Impacts*: To use the information gathered above to identify potential adverse impacts of project activities.

5. *Selecting Alternatives to Mitigate Impacts*: Based on the information gathered above, solutions can be devised to prevent foreseen impacts. The local community must participate in the choice and be satisfied with the decision, in order for the alternatives to be sustainable.
6. *Monitoring, Mitigation, and Evaluation*: Conditions change and some impacts become noticeable only in the long-term. Therefore, monitoring, mitigation, and evaluation should be considered as on-going activities throughout a project's life.

Gathering Information: the Scoping Process

■ Social Environment

After roles are defined, scoping is the initial phase of the assessment process. Its key element is community participation. Community participation should begin at the earliest stages in project planning. Collecting information on local conditions and past experiences can shed light on potential environmental problems. Anyone using this technique should realize that the information collected also yields a community profile and an inventory of the physical environment, which is of use in program development.

Who will gather such information? This needs to be determined in the beginning, and roles and responsibilities delineated early on. For the scoping process, trustworthy translation and appropriate social science skills are a necessity. (See the assessment worksheet Box 5.2, and "Community Environment and Resources Survey" above for more on this topic).

Community leaders can help the project designer with the preparation of a community profile. This profile can be an important planning tool if it is structured to provide easy-to-use data on a community's economic, social, and cultural characteristics. Data can be added or refined throughout the project development process.

The profile can include many topics, but the minimum profile should identify the following:

- social structure and family relation;
- cultural traditions and characteristic behavioral patterns;
- official leaders and other people of influence;
- social or special interest groups and their role;
- land-tenure policies and practices;
- educational organizations including informal methods and extension services;
- judicial procedures used to settle disputes;
- available health data including disease surveys, health facilities, and medical personnel;
- water management or water-rights policies, which may appear to be indistinct or informal; and
- human resources that could be available for a water development project, such as the type and amount of skilled and unskilled labor which could be spared from normal community activities.

■ Physical Environment

An inventory of the physical environment is also required. For a small-scale project, the inventory need not turn into an extensive environmental impact study. It should be a synopsis of the critical natural resources within the project area. As the project alternatives become more clearly defined, more detailed environmental data may have to be collected. The preliminary information should include the following topics:

<u>Water</u>

- Location and size of local water resources.
- Users and uses of local water resources.
- Quality of water.
- Water delivery system.
- Dependability of the water supply, annually and seasonally.

Box 5.2 Assessment Worksheet

This worksheet can assist planners of projects in all sectors to approach environmental assessment in a systematic way and to include all players in the process. The worksheet is meant to identify the main objectives and responsibilities of people involved, in order to properly foresee adverse environmental impacts.

Step 1. Defining Roles

Responsibility: Project planners and the local community.

- What role do environmental considerations play in the project?
- How much time and how many people are needed to complete the tasks associated with the environmental aspects of the project?
- Who is on the project design team?
- Will an environmental advisor be hired as a consultant? If so, what will he/she be contracted to do?
- If an environmental advisor is on the team, what is his/her responsibility?
- Is there an environmental advisor who can act as a resource person? If so, what information can he/she provide?
- Can community members set environmental goals and objectives, implement the plan, and/or monitor progress?
- If no environmental advisor is involved, who will be responsible for the project's environmental dimension?

Step 2. Scoping To Identify Information Sources

Responsibility: A social scientist or extension agent and the local community.

- What are the project's information needs?
- What are the existing sources of information about the community and the surrounding environment?
- Which of these sources are accessible?
- Is additional information needed beyond these existing sources? If so, what methods of research are appropriate?
- How much labor is available to gather and analyze information (either within the staff or the community)? Are the collectors capable of doing the necessary research? Does the project want to train either collectors or analysts?

Step 3. Review and Collect Additional Data

Responsibility: An environmental specialist or extension agent along with the community.

- What are the community's concerns about environmental and natural resource management?
- What socioeconomic and cultural characteristics of the community enable it to manage the environment effectively? Which lead to environmental degradation?

Box 5.2 Assessment Worksheet (Continued)

- How are natural resources used in the area? Which resources are especially fragile?
- Who are the environmentally vulnerable (e.g., the landless)?
- Based on the information that has now been gathered, what more needs to be known? How can this additional information be obtained?

Step 4. Determine the Environmental Impacts

Responsibility: Team members responsible for the environment, along with the community.

- Which project activities could be classified as having significant environmental impacts (see the Classification Checklist in Appendix A).
- What indirect effects on the environment could occur?
- How do project activities exacerbate the community's environmental concerns of the community? How do activities assuage them?

Step 5. Select Alternatives to Mitigate Impacts

Responsibility: Project team members responsible for the environment and social soundness and the community.

- What activities are being considered?
- What inputs and how much of these inputs are required (funds, labor, time, etc.)?
- Are the activities culturally acceptable to the community?
- What are the other social, economic, and ecological trade-offs? Are they worth the benefits to those involved?

Step 6. Monitor, Mitigate, and Evaluate the Project

Responsibility: Appropriate team members and the community.

- What adverse environmental impacts were foreseen during project planning?
- How does the community define the project's criteria for success or failure? Are local systems of measurement already in place?
- What indicators can be used to monitor the current and future situation with respect to:
  - sustainability of natural resources;
  - household food security;
  - infection rates;
  - participants' time constraints; and
  - income levels.
- What indirect effects have been identified since project began implementation?
- How often do the indicators need to be measured?
- What is the project team's and community's capacity to monitoring and evaluate?

- Type of vegetation around water sources.
- Type of protection of water resources.
- Water resource extremes (flooding and drought).
- Existing sanitation system: disposal of excreta—domestic, other places, livestock and other wastes; cultural factors; and health related problems.

Climate

- Annual rainfall patterns (when and how much).
- Annual temperature.
- Amount of annual rainfall.
- Pattern of wind (direction and velocity).
- Intensity of solar radiation.
- Relative humidity.

Soil

- Soil composition (gravel, sand, and clay).
- Amount of organic material in soil.
- Type of vegetative cover on soil.
- Depth of soil to bedrock.
- Soil permeability (relative rates of percolation).
- Amount of local erosion.
- Amounts of local fertilizers used.

Agricultural Practices (Irrigation)

- Types of crops grown.
- Amount of crops grown for local use.
- Food shortages or surpluses.
- Common pests (birds, rodents, and insects).
- Common pest control practices.
- Comparative crop yields (compared to national averages).
- Comparative crop yields (of different farmers in the community).
- Types of agriculture (rain-fed, irrigation, and flood recession).
- Factors limiting increased production.
- Amount and type of livestock grazing and migration.

Natural Communities

- Amount of natural forest.
- Amount of natural vegetation other than forest.
- Direct threats to natural communities.
- Common wild animal populations.
- Potential loss rate of endangered species.
- Degree of protection for natural areas.

The end result should help to shape project design and make the activities more sustainable. Such a profile of information will improve the efficiency of implementation, monitoring, and mitigation.

Box 5.3. Definitions of Key Environmental Review Terms*

Scope consists of the range of actions, alternatives, and impacts to be considered in an environmental review. The scope of an individual review document will depend on its relationships to other reviews. To determine the scope of environmental reviews, organizations should consider the types of actions, three types of alternatives, and three types of impacts:

1. *Actions* (other than unconnected single actions) can be:
   - Connected actions are closely related and automatically trigger other actions that may require environmental review; cannot/will not proceed unless other actions taken previously or simultaneously; and interdependent parts of larger action, depend on larger action for their justification.
   - Cumulative actions (viewed with other proposed actions), having significant impacts.
   - Similar actions, (viewed with other reasonably foreseeable or proposed agency actions), enable evaluating consequences together, such as common timing or geography.
2. *Alternatives*, which include: no-action alternative; other reasonable courses of actions; and mitigation measures (not in the proposed action).
3. *Impacts*, which may be direct, indirect, or cumulative.

Effects and Impacts (for purposes of environmental assessment) are synonymous words. Effects can be ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health—whether direct, indirect or cumulative. Effects can also include those resulting from actions having both beneficial and detrimental effects, even if on balance the agency believes that the effect will beneficial. "Effects" include:

- Direct effects are caused by the action and occur at the same time and place.
- Indirect effects are caused by the action and are later or farther removed in distance, but are still reasonably foreseeable. Indirect effects can include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Note that USAID's Environmental Procedures define significant effect in the sense of risk of significant harm to the environment and does not encourage balancing of beneficial versus harmful effects.

Cumulative Impacts results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what organization or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Mitigation includes avoiding the impact altogether by not taking a certain action or parts of an action; minimizing impacts by limiting degree or magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and compensating for impact by replacing or providing substitute resources or environments.

* From Council of Environmental Quality (CEQ) Regulations 40 CFR 1500 through 1508.

5.2 A SUMMARY OF USAID'S ENVIRONMENTAL REVIEW PROCEDURES

USAID's environmental procedures (22 CFR 216*) are U.S. Federal regulations and therefore represent a legal requirement as well as Agency policy. USAID uses these procedures to ensure that environmental factors and values are integrated into its decision-making processes.

These procedures also assign responsibility within the Agency for assessing the environmental effects of USAID's actions. They are meant to implement the intent and purpose of the National Environmental Policy Act of 1970 as they affect USAID development assistance programs.

The procedures were initially developed in 1976 as part of a settlement following a lawsuit brought by the Environmental Defense Fund and several other environmental organizations in 1975, to encourage USAID to comply with the provisions of the National Environmental Policy Act. The suit alleged that USAID had been negligent in considering the potential environmental impacts of its financing and procurement of pesticides for use in developing countries. As a result of the settlement, USAID produced guidelines and procedures for the environmental assessment of the agency's overseas development activities. It was the first international development assistance agency to develop such procedures.

USAID's environmental policy, as stipulated in the regulations, is to:

- ensure that the environmental consequences of USAID-financed activities are identified and considered by both USAID and the host country prior to the final decision to proceed and that appropriate environmental safeguards are adopted;
- assist developing countries in their ability to evaluate the environmental effects of development strategies and projects and to select, implement, and manage effective environmental programs;
- identify impacts of USAID actions; and
- define limiting factors that constrain development and identify and implement activities that assist in restoring the renewable resources base on which sustained development depends. (22 CFR 216.1 (b)).

Applicability of the Regulations

USAID's environmental procedures apply to all new activities authorized or approved by USAID and to "substantive amendments or extensions to ongoing activities." In practice, substantive amendments or extensions to ongoing activities are assessed for environmental impact only when:

- they include new components (e.g., addition of funds to construct a road not originally envisioned);
- they represent a significant expansion of scope over and above the original project (e.g., an expansion of dam construction into new geographical areas not envisioned in the original program design);
- the original activity was authorized prior to the existence of the regulations;
- commodities to be imported under an amendment are in addition to those reviewed during the original environmental review process; or
- unforeseen adverse impacts may have occurred since the original design.

Environmental Review and USAID Activity Design

Environmental issues should be examined from the beginning of the design process. Modification of an activity's design to take foreseeable impacts, both direct and indirect, into account will raise the probability of the activity's success and increase its contribution to sustainable development. Environmental

* Known colloquially as Regulation 216 or "Reg. 16." See section 2.4.

review thus should be an aid and not an obstacle to activity design. It strengthens activity proposals.

To help ensure sound design and implementation in a way that fully incorporates sustainability into USAID-supported activities, USAID is attempting to increase the knowledge and involvement not only of a mission's environmental officer (MEO) and foreign service national staff, but other in-country professionals who are engaged in activity design and implementation, including but not limited to: PVOs/NGOs, host government professionals, contractors, and university staff.

This section provides an overview of the preparation of environmental reviews of USAID-funded activities, programs and processes under USAID's Environmental Guidelines. Originally, these procedures required environmental review at defined points in the traditional process of design and approval of programs, projects, and activities; however, many of these concepts and defined points no longer exist in the reengineered operations system.

USAID's new Automated Directives System includes guidance (in Chapter 204) about how to apply USAID's Environmental Guidelines to the assistance process in order to ensure that USAID reviews the environmental consequences of all programs, activities, and substantive amendments thereto, in accordance with the requirements of USAID's Environmental Guidelines. For a detailed description of the environmental review process, please refer to the regulations (Appendix E). What follows here is a summary. [Note: these guidelines are not definitive; in case of doubt, refer to 22 CRF 216.] Figure 5.1 illustrates USAID's environmental review process.

USAID programs, components or activities can generally be broken down into six types according to the procedures to be followed under agency environmental guidelines. Programs or activities will either:

1. be eligible for exemption;
2. be eligible for categorical exclusion;
3. be eligible for neither of the above, but at the same time will not have significant adverse impact and will therefore require an initial environmental examination (IEE);
4. have a significant adverse environmental impact but will not have a significant adverse impact on the global U.S. environment and will require an environmental assessment (EA);
5. have a significant effect on the global or U.S. environment and will require an environmental impact statement (EIS); or
6. involve the acquisition and/or use of pesticides, and therefore may either (a) be "exceptable" due to emergency conditions (requires a waiver from USAID's Administrator); (b) require an IEE; (c) require an EA; or (d) require an EIS. Appendix C discusses the situations associated with the procurement or use of pesticides.

Special considerations apply to the acquisition and/or use of pesticides, which may either (a) be exceptable due to emergency conditions (requires a waiver from the USAID Administrator); (b) require an IEE; (c) require an EA; or (d) require an EIS. Appendix C covers the situations for the procurement or use of pesticides.

Normally there are four types of USAID staff who are in the environmental review and approval process:

- *Bureau Environmental Officer (BEO)*: Each USAID geographical or operational Bureau has a BEO who is responsible for reviewing and approving IEEs. The BEO is one the key players in the environmental review process. Without BEO's approval of the IEE, EA, etc., the activity cannot be authorized to receive funds.
- *Regional Environmental Officer (REO)***:** There is an REO in both of USAID's regional offices in Abidjan, Côte d'Ivoire and Nairobi, Kenya. The REO is responsible for assisting missions to prepare environmental review documents, and will work with the BEO and Regional Legal Advisor to facilitate the resolution and approval of the environmental review documents.
- *Mission Environmental Officer (MEO)***:** Most USAID Missions have a designated MEO who is responsible for the preparation of environmental review documents for Mission projects.

Figure 5.1 USAID's Environmental Review Procedures Under Regulation 216 (22 CFR 216)

- *Agency Environmental Coordinator* (AEC): Oversees the effective implementation of 22 CFR 216 throughout the Agency. This includes monitoring its implementation, interpreting gray areas of the legislation, resolving disputes, advising in selection of BEOs, and liaising with the President's Council on Environmental Quality and the public.

Decisions Regarding USAID's Activities

Exemptions

Activities eligible for exemption under 22 CFR Part 216 include:

- international disaster assistance;
- other emergency situations requiring formal approval; and
- circumstances with exceptional foreign policy sensitivities. The latter two require administrator (A/AID) or assistant administrator (AA/AID) approval after consultation, through the Agency Environmental Coordinator, with the Council on Environmental Quality (CEQ) about the environmental consequences of the proposed activity. These exemptions are not applicable to assistance for the procurement of pesticides. Procurement or use is interpreted to include transport of pesticides or control equipment, disposal, or ancillary support [22 CFR 216.2(e)], and includes pesticides procured by non-USAID parties as contributions to an activity in which USAID is participating.

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Categorical Exclusions

Certain activities are eligible for categorical exclusion (CE) under the regulations based on the following specific criteria. CE's are not automatically given just because an activity falls within one of the 15 standard CE categories. They must be requested and justified in writing and approved by the BEO. The criteria are:

- classes of actions that are not known to have and effect on the natural or physical environment;
- actions in which USAID does not have knowledge of or control over the details of the specific activities that can affect the environment; and/or
- research activities that can affect the environment but are of limited scope, are carefully controlled, and are effectively monitored [22 CFR 216.2(c)(1)]. Categorical exclusions are not applicable to assistance involving the procurement or use of pesticides. Reg. 16 covers 15 classes of actions for which CEs apply. See Appendix A for an itemization of the classes of action.

In cases where some activity components can be categorically excluded from environmental review and others cannot, it is best to split the different components into subsets according to the level of review required. For example, a family planning program that will also include construction of health facilities can be split into two subsets, in which the construction, if it is of a minor nature, can be recommended for a negative determination. If the program does not fall within one of the 15 classes of action cited, but one can make a solid case that it meets one or more of the three above criteria, then apply for a categorical exclusion just as one would normally.

No Significant Impact: IEE of Specific Activities

USAID units must prepare an IEE for all programs, components, or activities that:

- are not exempted;
- are not categorically excludable; but
- do not trigger an *a priori* positive determination.

IEEs must also be prepared for all activities involving the procurement or use of pesticides, even if an EA or EIS is required. The purpose of the IEE is to discern whether there significant adverse environmental impact is likely.

Box 5.4 Definitions in USAID's Environmental Procedures

Significant effect: "A proposed action has significant effect on the environment if it does significant harm to the environment." In contrast to U.S. domestic projects, such as by the U.S. Army Corps of Engineers, if a USAID project has a significant beneficial effect, then it is not considered to have a significant effect. The distinction between beneficial and adverse impacts within the USAID regulatory context is important. Under USAID regulations, only the negative effects in foreign countries need to be evaluated.

Initial Environmental Examination (IEE): The first review of the reasonably foreseeable effects of a proposed action on the environment. IEEs consist of two parts, the IEE facesheet, and the IEE text, documenting the analysis undertaken. An IEE provides the rationale for making threshold decisions. Well-reasoned and solid IEEs can often substitute for environmental assessments in carefully circumscribed situations (such as filling potholes in a short stretch of rural road), thereby saving considerable effort.

Threshold Decision: A formal agency decision that determines, based on an IEE, whether a proposed Agency action is a major action significantly affecting the environment. The recommended threshold decision is presented in the IEE for the BEO's consideration. It is the recommended threshold decision, based on the analysis in the IEE, that the BEO either concurs or does not concur with, and General Counsel clears or does not clear.

Negative determination or negative threshold decision: A determination, following preparation of an IEE, that an action will have no reasonably foreseeable significant adverse impact on the environment. Negative determinations are often recommended with conditions specifying monitoring or mitigation measures described in the IEE and which may require adjustments in the grant agreement and activity itself, prior to disbursement of funds.

Positive Determination or positive threshold decision: Determination that significant impact is likely, based on the preparation of the IEE, which makes the case that an activity will have a reasonably foreseeable chance of significant adverse impact on the environment, and that preparation of an EA or EIS will be required.

IEEs should be prepared along with an initial proposal, so that any modifications can be made to the activity design with a minimum of delay or difficulty. IEEs are prepared in the field by USAID staff or consultants and reviewed by the field mission, a REDSO, and the regional environmental office. IEEs are then forwarded to Washington for clearance by the General Counsel's office and approval by the BEO.

The IEE makes a threshold determination as to whether proposed activities will have a significant impact on the environment. A *negative* determination means the activity will have no significant impact, and a *positive* determination indicates it will have one. A *deferred* determination is one in which the IEE has been postponed until subactivities are identified. "Significant impacts" are defined in 22 CFR 216 as detrimental impacts.

Negative determinations are often recommended contingent upon monitoring or mitigation measures described in the IEE that require implementation and may require inclusion of covenants or conditions in the grant or nonproject assistance agreement. In certain cases, negative determinations based on solid IEEs can appropriately substitute for environmental assessments.

Positive determinations, or positive threshold decisions, lead to the next step, an EA or an EIS.

Significant Adverse Impact: Environmental Assessment

Certain classes of actions are judged *a priori* in USAID's Environmental Procedures as "normally having a significant effect on the environment" and for which an EA or an EIS will be required, as appropriate, unless a case is to be made that the program will not have a significant effect. Such classes of actions include:

- programs involving river-basin development;
- irrigation and water-management projects;
- agricultural land leveling;
- drainage projects;
- large-scale agricultural mechanization;
- new lands development;
- resettlement projects;
- penetration road building or road improvement projects;
- power plants;
- industrial plants;
- potable water and sewerage projects, other than small-scale ones;
- projects or programs involving the procurement or use of pesticides; and
- actions which may jeopardize a threatened or endangered species, or adversely modify its critical habitat; an EA or EIS "shall discuss alternatives or modifications to avoid or mitigate such impact" [22 CFR 216.5].

In addition, any action that may "jeopardize" an endangered species, or "adversely modify" its critical habitat, will require a positive determination, and an EA or EIS "shall discuss alternatives or modifications to avoid or mitigate such impact (22 CFR 216.5).

An IEE is not normally necessary for activities within these classes of action, except when a case is to be made that the action will not have a significant effect on the environment (22 CFR 216.2 (d)(2)) (Appendix A and E). The options for environmental assessment are as follows:

- An Environmental Assessment (EA) is performed when the impacts are activity- or program-specific (22 CFR 216.6). An EA is a detailed study of the reasonably foreseeable significant effects, both beneficial and adverse, of a proposed action on the environment of a host country or countries. An EA requires a level of analytical detail, host-country coordination, and time and effort that is a quantum step above that required for preparation of an IEE.
- A Programmatic Environmental Assessment (PEA) is performed to assess the environmental effects of a number of individual actions and their cumulative environmental impact on a regional basis within one or more countries or to assess the impacts that are generic or common to a class of actions of activities that are not country-specific (22 CFR 216.6(d)). In the Bureau for Africa, PEAs have come into increasing use, having been applied, for example, to pest management, relief to development, and rural roads programs.
- Environmental Impact Statements (EIS) are performed when agency actions significantly affect the United States or the global environment, or areas outside the jurisdiction of any nation, such as the oceans (22 CFR 216.7). To date, USAID has completed only one EIS, and that was in response to the lawsuit brought in 1975 (see Section 5.2).

The three environmental documents defined above analyze significant environmental issues, identify mitigation measures, and describe the development of M&E activities.

The cumulative environmental effects of a number of individual actions can be substantial. One of the advantages of a PEA is that it reduces the amount of time and paperwork associated with conducting sub-

Box 5.5 Programmatic Environmental Assessments (PEAs)

PEAs normally are prepared when an activity has many sub-activities that cannot be specifically identified up front, but that can be discussed in general terms as classes of sub-activities. An example would be an umbrella small grants program for NGOs to work on several kinds of sustainable development activities. Typically, this would include grants dealing with community and rural development services, public facilities and road rehabilitation work.

In a PEA, an EA is undertaken on the generic classes of activities for the region or country, and environmental procedures and guidelines are set up within the program. During implementation of the program, as site specific sub-activities are identified, they are reviewed under these approved procedures and guidelines as part of the program itself.

The cumulative environmental effects of a number of individual actions can be substantial. PEAs typically attempt to assess such cumulative effects.

One of the advantages of a PEA is that it reduces the amount of time and paperwork associated with conducting subsequent environmental reviews for an on-going program.

sequent environmental reviews for an ongoing program.

Defining Roles and Responsibilities. EAs, PEAs or EISs are usually completed by teams of consultants and strengthened by qualified local expertise, including PVOs and NGOs and USAID's regional environmental staff. USAID's Envrionmental Procedures contains details regarding the required contents of an environmental assessment (refer to Appendix E). The process of submitting and securing approvals for EAs and EISs is the same as for IEEs.

Before commencing the environmental assessment process, all parties should understand their roles and responsibilities in regard to information gathering, monitoring of impacts during activity implementation, and mitigation of impacts. Collaboration among USAID, the host country's government, and the participation of local community resource users regarding responsibilities is critical.

Deferral of a Threshold Decision

Environmental review can be deferred when programs, activities, or subactivities have not been specifically identified at the time of authorization. When possible, deferral should be minimized, since many USAID activities (as high as 20 percent in the past) have had unforeseen significant environmental impacts that might have been avoided or mitigated by completing an IEE during the design process. In cases of deferral, Reg. 16 calls for the application of covenants or conditions precedent to ensure that environmental review of the specific activities deferred will be completed prior to an irreversible commitment of resources.

Where it is not possible to identify activities in sufficient detail to permit completion of an IEE, initial proposals IEE shall contain:

- an explanation of why the IEE cannot be completed;
- an estimate of the amount of time required to complete the IEE; and
- a recommendation that a threshold decision be deferred until the IEE is completed.

USAID acts on a deferral request concurrently with action on the initial proposal and designates a time for completion of the IEE. This completion date will normally be sufficient for preparation of an EA or EIS, if required, before a final funding decision is made. Some exceptions are permitted (see 22 CFR, 216.3 (a) (7)).

Classifying Activities with Multiple Components

In classifying actions that are part of an activity or program with several components, some actions may qualify for a categorical exclusion, others may qualify for a negative determination, and still others may necessitate a positive determination. Thus, within an activity or program, several classifications can apply, depending on the nature and mix of the particular actions. In practice, many activities or component actions therefore receive negative determinations with conditions. Conditions typically invoked include specific ways of implementing an activity in an environmentally preferable manner, subsequent environmental reviews of individual actions, mitigative measures, training or technical assistance related to environment, or monitoring requirements.

Special Provisions for Areas of USAID's Activities Where Assistance May Be Denied, or an IEE or EA is Required

Pesticide Regulations

If USAID's resources are proposed for any activities that will involve assistance for the procurement or use, or both, of pesticides, planners must take into account USAID's Pesticide Procedures (22 CFR 216.3 (b)). The term "use" is not defined in 22 CFR 216, and in practice has been interpreted broadly, to include the handling, transport, storage, mixing, loading, application, clean up of spray equipment, and disposal of pesticides, as well as the provision of fuel for transport of pesticides and providing technical assistance in pesticide management. Importantly, it also means that even if another donor or organization provides pesticides that are used in a USIAD-funded activity, 22 CFR 216 applies to these pesticides even though USAID is not providing them directly

The Pesticide Procedures do not apply in certain exceptional situations, such as for:

- "projects under emergency conditions," which are "deemed to exist when it is determined by the Administrator in writing that a pest outbreak is imminent, significant health problems will occur without the prompt use of the proposed pesticide, and insufficient time is available before the pesticide must be used." In this situation, rarely invoked, all appropriate mitigation measures must be taken to the extent possible;
- projects where USAID is a minor donor to a multidonor project meeting the criteria listed in 22 CFR 216.1(c)(12) and where the Agency Environmental Coordinator has determined that the lead donor's environmental procedures are adequate; and
- projects including assistance for procurement or use of both, for highly controlled pesticide research (as described in 22 CFR 216.3 (b)(2)(iii)) and pesticide regulatory activities is not subject to scrutiny under the pesticide procedures.

USAID finances pesticides only on a case-by-case basis (and not on the basis of an approved commodity list) and then only after specific additional evaluation that would consider the potential benefits conferred by the use of the proposed pesticide. An EA is not necessarily required. If the pesticide is registered for the same or similar uses by the USEPA, all that is needed is to prepare an IEE. That IEE, however, must be considerably more detailed than a regular IEE and must include a "separate section evaluating the economic, social and environmental risks and benefits of the planned pesticide use to determine whether the use may result in significant environmental impact."

Also, the IEE must include a discussion that responds to the 12 factors outlined in 22 CFR 216.3(b)(1). The IEE will then recommend either a negative or positive determination, depending on its findings. These factors to be considered in such an assessment are outlined in Appendix C, Safe Pesticide Use Guidelines.

Tropical Forests, Biological Diversity, and Endangered Species[*]

Environmental and Natural Resources: Section 117 emphasizes the need for the United States to exercise leadership in reassessing policies related to the environment and natural resources and in "cooperating extensively with developing countries in order to achieve environmentally sound development." To achieve this goal, the section indicates that: "Special efforts shall be made to maintain and where possible to restore the land, vegetation, water, wildlife, and other resources upon which depend economic growth and human well-being, especially of the poor."

The section also requires USAID to "take fully into account" the impact of its activities on the environment and natural resources of developing countries. Where appropriate, Section 117 (c)(1) encourages USAID to use local technical resources in preparing environmental assessments or impacts statements that may be necessary.

Tropical Forests: Based on amendments to the 1992 U.S. Foreign Assistance Act (FAA), assistance must either be denied or an EA pursuant to Regulation 16 must be conducted for any activities that:

ninvolve the procurement or use of logging equipment, unless an EA indicates that all timber harvesting operations involved will be conducted in an environmentally sound manner, that minimizes forest destruction, and that the proposed activity will produce positive economic benefits and sustainable forest management systems; and

- have the potential to significantly degrade national parks or similar protected areas or introduce exotic plants or animals into such areas.

Section 118 of the FAA also precludes assistance for certain activities unless an EA indicates that the activity will contribute significantly and directly to improving the livelihoods of the rural poor and will be conducted in a manner that supports sustainable development. Prohibited activities include:

- conversion of forest lands to the rearing of livestock;
- construction, upgrading, or maintenance of roads that pass through relatively undegraded forest lands;
- colonization of forest lands; or
- construction of dams or other water control structures that flood relatively undegraded forest lands.

Commercial Extractive Forestry: The expenditure of funds is prohibited for any activity, program, or project that "would result in any significant loss of tropical forests" or involve "commercial timber extraction of primary tropical forest areas" unless an environmental assessment:

- identifies potential impacts on biological diversity;
- demonstrates that all timber extraction will be conducted according to an environmentally sound management system that maintains the ecological functions of the natural forest and minimizes impacts of biological diversity; and
- demonstrates that the activity will contribute to reducing deforestation.

Biological Diversity and Endangered Species: Section 119 of the Foreign Assistance Act specifies that the preservation of animal and plant species through the regulation of the hunting and trade in endangered species, through limitations on the pollution of natural ecosystems, and through the protection of habitats is an important objective of the United States development assistance. USAID must ensure that ongoing and proposed actions by the Agency do not inadvertently endanger wildlife or plant species or their critical habitats, harm protected areas, or have other adverse impacts on biological diversity. Assistance must be denied for actions that significantly degrade national parks or similar protected areas or introduce exotic plants or animals into such areas.

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* Foreign Assistance Act Amendments (P.L. 87-185 as amended), Sections 117, 118, and 119 relating to overseas assistance affecting Tropical Forestry and Biodiversity.

Similarly, Section 119 provides for the denial of assistance unless an EA indicates that the proposed activity will contribute significantly and directly to improving the livelihood of the rural poor and will be conducted in an environmentally sound manner which supports sustainable development.

Country Analysis Requirements Under Section 118 and 119 of the Foreign Assistance Act: All USAID missions are required under these sections to provide information on tropical forests as appropriate in their country development strategy. The information should contain an analysis of:

- actions necessary in that country to achieve conservation and sustainable management of tropical forests; and
- the extent to which the actions proposed for support by the Agency meet the needs identified.

The Bureau for Africa has produced separate guidelines which define the approach to be taken by mission in considering biological diversity and tropical forests in their strategic planning (Russo, 1994).

Activities with Special Environmental Review Practices

Activities Financed with Local Currency

Activities financed by host country-owned local currency (e.g., P.L. 480) could cause or contribute to adverse effects on the environment but they are not, as a legal matter, subject to Reg. 16 procedures. The Bureau for Africa has dealt with local currency issues for many years under the Development Fund for Africa as a "common sense" issue, i.e., although local currency funded activities do not fall within the letter of the law, they must still be addressed within the spirit of the law. The high visibility of these activities provides a reason for doing so. Host countries or the U.S. public draw no fine distinctions between grants and projects; the Bureau/Agency is deemed at fault if negative impacts result, regardless of funding mechanics. More compellingly, experience has shown that without environmental considerations, activities tend to be poorly designed and are subject to failure.

Thus, the Bureau expects missions to be sensitive to this issue in approving host country-owned, local-currency activities whenever possible. When local currencies are programmed for general budget support, it may not be practical to do so; however, when they are approved for specific, project-type activities, it becomes feasible to take environmental impacts into consideration. A further consideration is that most governments now want to include environmentally sound practices within their development activities as matter of national, regional or local policy.

In the case of local currency use for development activities, technically, USAID's environmental regulations do not apply. However, the Agency is no less committed to sound environmental review of their consequences. An guidance cable on this subject (88 State 066242) recommended that responsible safeguards ensuring that environmental concerns be taken into account in the design and implementation of projects and programs supported by jointly programmed local currency and trust funds.

In-country procedures to evaluate any long-term environmental impacts of activities funded with generated local currency already exist in many countries. The MEO will ensure that the responsible staff in the appropriate ministry for environment or natural resources will be made aware of USAID concerns, and that they will be asked to provide occasional progress reports to the mission. The cash grant program should also include some support for training environmental staff within the host country to implement monitoring and mitigation efforts related to these activities and in developing an adequate response mechanism if adverse impacts are uncovered.

Intermediate Credit

The following paragraphs represent current Bureau practice regarding environmental review of intermediate credit assistance activities:

For credit components to qualify for a categorical exclusion under Reg. 16, missions must affirm that their purpose is the equivalent of capitalizing an intermediate credit institution (ICI) (e.g., capitalizing a guaranty facility, as contrasted with the making of each guaranty), and that USAID does not retain the right to review and approve each loan (or equivalent) by the ICI, and does not know what kinds of activities are being funded. This is the case regardless of whether USAID's funds are used for loan guaranty or for actual loans.

If a categorical exclusion is not appropriate, the MEO should provide a recommendation for an IEE, which will provide for a negative or positive determination, or a deferral of this component, together with supporting information. Identification of possible types of participating businesses, and the existence of or potential for environmental guidelines, for the loans guarantees is relevant. Resources could be used for technical assistance, training, promotional support to test models, and to provide close monitoring of each intervention to determine modifications necessary to arrive at the most acceptable approach.

Nonproject Assistance (NPA) and Environmental Impacts

Nonproject assistance is a tool for providing generalized resources to assist host governments in achieving agreed-upon macroeconomic or sectoral results. The Bureau's NPA programs are always in the form of sector assistance (e.g., education, agriculture) and are focused on achieving policy, procedural and institutional reforms to alleviate constraints and bottlenecks to improve economic performance.

In Africa, NPA typically includes corresponding technical assistance and capacity-building components. This has proven to be a highly effective multifaceted NPA/technical assistance instrument to address the core of sustainable development in Africa (Schwartz 1996).

Program assistance is distinct from traditional "projectized" assistance in several ways. With traditional project assistance, donors finance specific inputs such as technical assistance, commodities, training, and construction. With program assistance in the Bureau-funded NPA sense, USAID's resources are not directly linked to specific on-the-ground interventions. Instead, program assistance is disbursed against specific policy or institutional actions that a host-country initiates.

The policies and actions against which assistance is disbursed are developed through policy dialogue with the recipient country. Some examples of policy reforms associated with economic development include changes regarding:

- privatization of public and parastatal enterprises;
- conditions enabling improved access to credit;
- traditional or legal land tenure;
- marketing and pricing of agricultural products; and
- trade policy and the terms of trade between agriculture and industry.

Within the Bureau for Africa, NPA involves four main funding modalities, each with different goals (Rock 1995). Many of USAID's NPA programs mix these funding modalities to achieve policy and institutional reforms:

- cash transfer for macroeconomic reform through the Economic Support Fund;
- cash disbursement grants through the Bureau-financed sectoral programs;
- Commodity Import Programs (CIP), and
- commodity aid through Public Law 480.

Environmental Implications. What are the indirect environmental implications of donor-financed policy and institutional reforms in sub-Saharan Africa? This is a question addressed only recently, but for which the literature is growing rapidly (Rock 1995, World Bank 1994). USAID is legally required to address this question.

The 1992 FAA (Section 496, H.R. 5368) requires that institutional and policy reforms include provisions to protect long-term environmental interests from possible negative consequences of policy reforms. The requirement calls for an analytical consideration of policy reforms that are likely to have an impact environmental management in the long run.

Despite this requirement, USAID has limited authority regarding the mitigation of potential environmental impacts associated with policy initiatives. A key approach to dealing with this is to encourage the development of environmental monitoring, evaluation, and mitigation capacity within the host country.

The Bureau expects IEEs to be completed for all sector NPA. The IEE must examine the potential impact of the reforms on the biophysical environment. Some of the problems and analytical issues are the same for NPA, so it is important to follow the same approach to integrating the analysis of potential environmental impacts into the design process for NPA. An environmental specialist should be included on the NPA design team, and he/she should provide input on the subsequent development of the associated M&E plan as well.

Pesticides and NPA. One issue deserving more attention is the indirect implications of sectoral adjustment and policy reform on pesticide procurement and use. Marketing reform and economic liberalization in the agricultural sector conceivably could influence the increased use of pesticides without having the concomitant regulatory and infrastructure support mechanisms in place to ensure that human and environmental consequences do not result.

Protection of Vulnerable Groups in Light of Policy Reforms

Assisted policy reforms shall also include provisions to protect vulnerable groups (especially poor, isolated, and female farmers; urban poor; and children, including displaced children) and long-term environmental interests from possible negative consequences. This is a design factor, especially with respect to nonproject assistance.

New Directions in Environmental Procedures in USAID

USAID, as a "reinvented, learning institution," has introduced major changes in its operations systems, with a strengthened focus on results (rather than activities), greater accountability and empowerment, teamwork, participation and customer orientation. A major objective is to provide USAID's operating units and collaborators the flexibility they need to adapt to changes during implementation. The underlying rationale is to focus on results, while still managing inputs and monitoring outputs properly, and to give those responsible (including the host country partners) for achieving results the flexibility to change approaches and tactics as situations change or lessons are learned.

Reengineering of USAID has heightened the focus on environmental sustainability as being integral to USAID's development goal. To meet this goal it is essential that environmental considerations be incorporated into results planning, achieving, and monitoring. The Agency's reengineering can be expected to intensify the need to develop programming consistent with the Agency's Environmental Procedures and with principles of environmental soundness.

The Bureau for Africa's Environmental Office, in conjunction with the Regional Environmental Offices, has undertaken an initiative for environmental management capacity building (ENCAP). This initiative is intended to support USAID/AFR Missions, their implementing agents, and collaborators. An important rationale for this initiative is that the Bureau's environmental and legal staff anticipate providing enhanced responsibility to carry out environmental reviews to those USAID missions whose designers and/or implementors have successfully completed an environmental assessment course or participated in related capacity-building activities.

Relevant agency experience has shown that such enhanced mission authority can facilitate field-level activity design and implementation. These environmental guidelines are consistent with USAID's new precepts of flexibility.

5.3 AFRICA BUREAU ACTIVITY CATEGORIZATION PROCESS FOR NGO/PVO GRANTS AND SUBGRANTS

USAID and its Bureau for Africa have increased their reliance upon PVOs and NGOs over the past several years. This support generally occurs through "umbrella" projects, which can result in considerable numbers of subgrants, usually with a variety of NGO/PVO grantees.

Increased association with the PVO and NGO community has stimulated an interest in providing environmental management capacity building opportunities and guidelines to ensure that such activities are consistent with USAID's Environmental Procedures. These guidelines are fundamentally similar to those outlined for the IEE process, but they are tailored to umbrella project subgrantees where the umbrella grant IEE has already been completed. The umbrella grant IEE normally will specify conditions intended to ensure environmental accountability and soundness. Typically, the programs will have an approved PEA or umbrella environmental review or EA, and the subgrants will examine the environmental impacts within the context of the umbrella grant's environmental analysis.

Environmental Review and Capacity Building Procedures

With respect to subgrants, the environmental review procedures specify how the subgrants, and associated mitigation actions, will be identified and reviewed on an individual basis after project authorization in accordance with the threshold decision (per 22 CFR Section 216.3(a)(2)). Specifically, it is assumed that USAID Missions will have the following sorts of elements in effect to promote environmental review and capacity building within the umbrella grant PVOs/NGOs and CBOs:

- Screening: Subgrants will be individually reviewed and screened according to an Environmental Screening Form (ESF) (Appendix B), which will categorize each subgrant or subactivity. The 4-tier categorization process is according to the Africa Bureau Environmental Guidelines for Small-Scale Activities in Africa, or as further defined in the umbrella project IEE;
- Capacity Building: PVOs, NGOs and CBOs will help design and conduct, participate in, and apply, appropriate training in environmental assessment and management, in conjunction with USAID and host country resource organizations and authorities;
- Umbrella Environmental Reviews: The applicable recommendations of USAID Programmatic Environmental Assessment (PEA), umbrella environmental reviews, and/or any supplementary environmental assessments (SEAs) will be adhered to as appropriate by the responsible parties;
- Host Country Environmental Policies and Procedures. The lead PVO, and as appropriate, the indigenous NGOs and CBOs, are encouraged to help develop and apply host country environmental policies;
- An Environmental Monitoring and Evaluation process will be put in place and used by the lead PVO, NGOs and CBOs, in collaboration with host country authorities and USAID project management; and
- The Mission will keep the BEO and REO apprised of subgrants provided, including the type/nature, scale, funding levels and status of the individual subgrants approved under the process described in the umbrella grant IEE.

Screening and Environmental Review Procedures for PVO/NGO Grantees and Subgrantees

The Bureau for Africa has developed an Environmental Screening and Reporting Form (ESF) that is consistent with the IEE process and that can assist USAID missions and their implementing partners with design and implement activities in an environ-

mentally sound manner, in accordance with all salient agency policies and procedures. Use of the ESF will reduce the need for review and approval of NGO grant activities at the regional or Washington levels.

To ensure that individual interventions are designed in a sustainable manner, the MEO and/or USAID project officer or manager provides the lead PVO/NGO under the umbrella grant (and, as appropriate NGOs and CBOs subgrantee applicants), with a copy of the Africa Bureau's *Environmental Guidelines for Small-Scale Activities* and the generic Screening Form, which is provided in Appendix B.

Missions may further refine this form with PVOs/NGOs and the REDSO REO or REA in order to tailor the screening process to the umbrella project's purposes and to incorporate, as appropriate, information that will serve to identify the need for environmental assessment in accordance with a host country's environmental assessment policy and existing or proposed legislation.

Adherence to the procedures in the original umbrella project IEE cannot be considered in lieu of compliance with a host country's requirements or vice versa. The proposals for subgrants should also indicate how potential negative impacts will be mitigated prior to and during activity implementation, if they are detected during monitoring and evaluation.

All activities and subgrants not recommended for a categorical exclusion will be individually reviewed according to the Screening Form, which utilizes a categorization process consistent with USAID's Environmental Procedures (22 CFR 216), as defined below.

Category 1: Subgrants that would normally qualify for a categorical exclusion under USAID's Environmental Procedures (e.g., community awareness initiatives, training at any level, provision of technical assistance, controlled experimentation exclusively for the purpose of research and field evaluation, which is confined to small areas and carefully monitored, etc.). The rehabilitation of water points for domestic household use, shallow, hand-dug wells, and small water-storage devices and construction or repair of facilities under 10,000 square feet (approximately 1,000 square meters) can be placed in this category.

Category 2: Subgrants that would normally qualify for a negative determination under USAID's Environmental Procedures, based on the fact that the grantee will use an environmentally sound approach to the activity design and incorporate appropriate mitigation and monitoring procedures. (For example, the design followed, and the manager has access to and will follow, a series of guidelines for the design of small-scale environmentally sound activities in forestry, water supply, and sanitation, rural roads, etc.) Rehabilitation or construction of facilities or structures exceeding 10,000 square feet would normally fall under Category 2. Funding levels would also normally not be in excess of $200,000 per discrete activity. In any case, an Environmental Review Report will be prepared for all Category 2 projects.

Category 3: Subgrants where significant environmental impacts are likely such as those involving land development, forest harvesting, planned resettlement, penetration road building, substantial piped water supply and sewage construction, and projects involving the procurement and/or use of pesticides, or of large-scale or area-wide application of pesticides. Also, some light industrial plant production or processing (sawmill operation, agroindustrial processing of forestry products) could qualify.

Category 4: Activities not funded or funded only when specifically defined findings are made to avoid or mitigate the impacts, based on an EA such as:

- actions determined likely to significantly degrade protected areas, such as introduction of exotic plants or animals;
- actions determined likely to jeopardize threatened and endangered species or adversely modify their habitat (e. g., wetlands, tropical forests);
- conversion of forest lands to the rearing of

livestock;

- planned colonization of forest lands;
- procurement or use of timber harvesting equipment;
- commercial extraction of timber;
- construction of dams or other water control structures that flood relatively undegraded forest lands;
- construction, upgrading or maintenance of roads (including temporary haul roads for logging or other extractive industries) that pass through relatively undegraded forest lands.

All items listed in USAID's Environmental Prodcedures (Sect. 216.2(d)(1)) are automatically included in Categories 3 and/or 4, unless such items qualify for a negative determination in accordance with the criteria listed under Category 2. All Category 3 and 4 activities under consideration must be submitted to the REO and BEO and to the Regional and Bureau legal officers.

The lead PVO/NGO will use the Screening Form (Appendix 2), as refined in consultation with the MEO and REDSO's REO or REA, to review subgrant proposals to determine which category the activity falls. The MEO will then review and clear the draft category determination and any environmental review reports prepared as a result of the categorization. The majority of subgrants will fall within Categories 1 and 2, and will, therefore, be approved locally by the USAID representative without further external review, given that appropriate sound implementation and environmental monitoring and mitigation procedures will be in place. The MEO and/or mission project officer or manager shall, on a routine basis, pass to the REO and BEO an updated list of grants, with a summary of activities and the disposition of the environmental categorization and review process in order to keep them apprised of the sector and scope of activities involved.

All Category 3 and Category 4 subgrants, and possibly some Category 2 subgrants, will be subjected to additional environmental assessment, as deemed appropriate in consultation with the BEO and REO, and passed on to the Regional and Bureau environmental and legal officers for further review and clearance.

Prior to the approval of any subgrant, results of the environmental categorization must be available and considered. For Category 2 projects, environmental review reports, including MEO review and, if needed, REO or BEO review, must be performed prior to funding. For any Category 3 or 4 projects, approval cannot be considered until environmental documentation as determined by the BEO has been prepared.

Environmental Responsibilities

The USAID mission or Operating Unit is to assume responsibility for environmental review and oversight of all subgrants in support of the umbrella environmental analysis or PEA as outlined below:

- lead PVO and NGOs or CBOs, as appropriate, will submit proposals that consider potential environmental impacts and their mitigation, including avoidance, and will design the activities with an environmental monitoring system in place.
- lead PVO will use the Screening Form to categorize proposals, and the MEO will review and pass on to REO and BEO any Category 3 or Category 4 and, as he/she determines, some Category 2 activities.
- lead PVO, NGOs and CBOs, as appropriate, will ensure implementation of mitigating measures and long-term environmental impact monitoring.
- MEO and the project officer and/or project manager will retain ultimate responsibility for monitoring the environmental impacts of grants.
- USAID Operating Unit should have an indicator to monitor and report on its success in implementing environmental reviews of subgrants;
- periodic visits of the REO or REA will also be requested for advice and validation of the process.

- all parties are to utilize the Environmental Screening Form, prepared for each proposal or grant. The form is formatted as a checklist and will serve as a tool to summarize on a routine basis the area and scope of activities of each subgrant and the overall project.

Environmental Monitoring and Mitigation

In drafting proposals, designers must address the way in which their interventions will be monitored and evaluated during the course of the activity. Indicators to be used in monitoring should be defined in the grant designs. The implementing agents involved will be fully responsible for monitoring and evaluating all activities under each program or project, and for sending to the Bureau and/or REO any evaluations, reviews, and mitigation plans, especially for Category 3 and 4 activities.

By planning for monitoring and mitigation in project and program designs, planners should assure that funding will later exist for such activities. Proposals should also indicate how negative impacts will be mitigated, if and when they are detected during monitoring and evaluation. An example would be PVOs/NGOs involved in agricultural production, who could adopt a policy to encourage IPM and other sustainable agricultural practices.

References and Suggested Literature

Core Documents

Altieri, Miguel. 1988. *Environmentally Sound Small-Scale Agricultural Projects*. Revised edition. Arlington, Virginia: Coordination in Development (CODEL) and Volunteers in Technical Assistance (VITA). Guidelines for planning, project design, and implementation of agriculture projects with a community development emphasis. Includes technical and ecological information. Aimed at the general user. *To order*: see below.

Bassan, Elizabeth, and Wood, T. 1985. *Environmentally Sound Small-Scale Energy Projects*. Arlington, Virginia: CODEL and VITA. Guidelines for planning, project design, and implementation of energy projects. Addresses natural resources use for energy in a way that maintains ecological well-being. Aimed toward the general user. *To order*: see below.

Brown, Michael, and Wyckoff-Baird, B. 1992. *Designing Integrated Conservation and Development Projects*. Washington, DC: Biodiversity Support Program. Discusses the incorporation of environmental conservation into development projects. Includes case studies and recommendations. *To order*: World Wildlife Fund Publications, PO Box 4866, Hampden Post Office, Baltimore, Maryland 21211. Telephone: (410) 516-6951, Fax: (410) 516-6998.

CODEL. 1981-86. Series on environmentally sound small-scale projects. Listed as published by CODEL and VITA. Arlington, Virginia: CODEL and VITA.

Ffolliott, Peter, and Thames, J. 1983. *Environmentally Sound Small-Scale Forestry Projects*. Arlington, Virginia: CODEL and VITA. Guidelines for planning, project design, and implementation of forestry and agroforestry projects. Meant for the general practitioner, with an emphasis on community development. *To order*: see below.

Harza Engineering Company. 1980. *Environmental Design Considerations for Rural Development Projects*. Washington, DC: USAID. A manual for identifying potential societal benefits and undesirable environmental impacts that may accompany small rural projects. The sectors covered are: roads; electrification; water supply and sanitation; irrigation and on-farm water management; and small industries. *To order*: USAID, Center for Development Information and Evaluation, Washington, DC 20523.

Jacobs, Linda. 1986. *Environmentally Sound Small-Scale Livestock Projects*. Arlington, Virginia: CODEL and VITA. Guidelines for planning, project design, and implementation of livestock and range management projects. Includes material on waste management, health, and husbandry. *To order*: see below.

Roe, Dilys, Dalal-Clayton, B., and Hughes, R. 1995. *A Directory of Impact Assessment Guidelines*. Nottingham, United Kingdom. Environmental Planning Group, International Institute for Environment and Development.

To order **CODEL/VITA documents**: VITA Publications, PO Box 12028, Arlington, Virginia 22209. (703) 435-3245. No fax orders. $12.95 (USA; includes shipping), $15.95 (overseas surface), $19.75 (overseas airmail).

International Environmental and Natural Resources Assessment Information Service (INTERAISE) Project.

Tillman, Gus. 1981. *Environmentally Sound Small-Scale Water Projects*. Arlington, Virginia: CODEL and VITA. Guidelines for planning, project design, and implementation of water resource development projects. Suggests low-cost techniques to avoid adverse impacts of water development. *To order*: see bottom of pg. 117.

World Bank. 1991. *Environmental Assessment Sourcebook*. 3 volumes. Washington, DC: The World Bank Environment Department. Provides guidelines for environmental assessment, focusing on those operations with major potential for negative environmental impacts, such as new infrastructure, dams, and highways. Discusses World Bank environmental policies and procedures, as well as "best practice" guidelines regarding design choices. Volume II includes sector guidelines for: agriculture; rural development; population; health and nutrition; transportation; urban development; water supply and sewage; energy; and industry. *To order*: Publications Sales Unit, Department F, The World Bank, 1818 H St. NW, Washington, DC 20433. The latest edition is available free of charge.

Volume I: Policies, Procedures, and Cross-sectoral Issues

Volume II: Sectoral Guidelines

Volume III: Guidelines for Environmental Assessment of Energy and Industry Projects

Wyatt, Alan, et al. 1992. *Environmental Guidelines for PVOs and NGOs: Potable Water and Sanitation Projects*. Arlington, Virginia: Water and Sanitation for Health Project (WASH). Provides a framework to help project designers avoid, minimize, or mitigate the potential adverse impacts of small- and medium-scale water supply and sanitation projects in rural and urban areas. Guidelines are used by USAID to evaluate grant proposals that involve water supply and sanitation activities. *To order*: c/o Environmental Health Project Officer, Office of Health and Nutrition, Global Bureau, USAID, SA-18, Washington, DC 20523-181. Telephone: (703) 875-4480, Fax: (703) 875-4686.

U.S. Environmental Protection Agency Technical Information Packages (TIPs)

Here is a list of technical brochures from a series published by the US EPA and meant for activities outside the United States. This is not a bibliography of the entire series but a selection of brochures that relate directly to these guidelines. For more information, please contact: The Center for Environmental Research Information, USEPA, PO Box 19963, Cincinnati, Ohio, 45219-0963. Telephone: (513) 569-7562. Fax: (513) 569-7566. When ordering documents, the EPA document number or the exact title is necessary.

USEPA. 1992. *Environmental Impact Assessments*. TIPs Series. Washington, DC: USEPA. Document no. EPA/600/M-91/037.

_____. 1992. *Pesticide Usage Guidelines*. TIPs Series. Washington, DC: USEPA. Document no. EPA/600/M-91/035.

_____. 1992. *Pesticides Waste Disposal*. TIPs Series. Washington, DC: USEPA. Document no. EPA/600/M-91/028.

_____. 1992. *Risk Assessment*. TIPs Series. Washington, DC: USEPA. Document no. EPA/600/M-91/034.

_____. 1991. *Small Community Wastewater Systems*. TIPs Series. Washington, DC:USEPA. Document no. EPA/600/M-91/032.

_____. 1991. *Solid Waste Disposal*. TIPs Series. Washington, DC: USEPA. Document no. EPA/600/M-91/030.

_____. 1991. *Ensuring Safe Drinking Water*. TIPs Series.—Washington, DC: USEPA. Document no. EPA/600/M-91/012.

Other Issues Treated in the TIPS Series:

Environmental Management

Hazardous Waste

Air Quality

Water Quality

Regulating Pesticides

Pollution Prevention

Mining Waste Management

Other sources and further reading on subjects covered in these Guidelines

Sections 1.0 & 2.0: General

African Development Bank. 1994b. *African Development and the Environment*. Abidjan, Ivory Coast.

Environment and Natural Resources Information Center. 1993. *USAID Environment & Natural Resources News*. Arlington, Virginia: Datex, Inc.

EPAT. 1995. *Participants' Sourcebook: USAID's Africa Regional Environmental Assessment Training Course*. Arlington, Virginia: Winrock International Environmental Alliance.

Falloux, Francois, et al. 1991. *Progress and Next Steps For National Environmental Action Plans In Africa.* Washington, DC: World Bank. Environment Division.

Geldenhuys, G. C., Kruger, F. J., and Scholes, R. J. 1994. *Resources Potential of Southern Africa Ecosystems: Some Strategic Issues for Sustainable Development*. Division of Forest Science and Technology, Ecosystem Management Services. Forestek, Center for Scientific and Industrial Research (CSIR). Report for I-428. Pretoria, Republic of South Africa. February.

Munro, R. 1994. *SADC Regional Policy and Strategy for Environment and Sustainable Development -- Equity-led Growth and Sustainable Development in Southern Africa*. Southern Africa Development Community. August (draft). Maseru, Lesotho. 6p.

NESDA. 1995. *Proceedings of the Workshop on Institutional Mechanisms for Environmental Management in Africa*. March 28-31, 1995. Addis Ababa. Abidjan, Côte d'Ivoire: NESDA.

O'Connor, David, and Turnham, D. 1992. *Managing the Environment in Developing Countries*. Paris: Organization for Economic Co-operation and Development (OECD).

OECD, Development Assistance Committee. 1992. *Guidelines on Environment and Aid.* 4 volumes. Paris: OECD.

Otto, Jonathan, and Drabek, A. 1992. *Designs for Collaboration: A Study of PVO/NGO Umbrella Projects in Africa*. Washington, D.C.: Datex, Inc.

Reed, David. 1992. *Structural Adjustment and the Environment.* London: World Wildlife Fund.

Talbott, Kirk. 1990. *Public Participation in African Environmental Action Plans.* Washington, DC: World Resources Institute, Center For International Development and Environment.

USAID. 1994. *Strategies For Sustainable Development.* Washington, DC: USAID.

_____. 1992.*Plan for Supporting Natural Resources Management in Sub-Saharan Africa (PNRM).* Bureau for Africa. Washington, DC: USAID.

_____. 1996. *Plan for Supporting Environmental and Natural Resources Management in Sub-Saharan Africa (PENRM)*. Bureau for Africa. Washington, DC: USAID.

USAID, Bureau for Africa, Office of Analysis, Research, and Technical Support. 1993a. *Towards a Sustainable Future for Africa: Im-*

proved Natural Resource Management under the Development Fund for Africa, 1987 to 1993. Washington, DC: USAID.

Voluntary Agencies Development Assistance (VADA). 1991. *A Handbook on the VADA/ NGO Co-Financing Project*. Nairobi, Kenya: VADA.

Weber, Fred. 1990. *Preliminary Indicators For Monitoring Changes in the Natural Resources Base*. USAID Program Design Evaluation Methodology No. 14. Washington, DC: USAID.

Winrock International Environmental Alliance. 1992. *Assessment of the Advisability of Delegating Environmental Authorities to Africa Bureau Field Missions*. Arlington, Virginia: EPAT.

World Bank. 1995. *Toward Environmentally Sustainable Development in Sub-Saharan Africa: A World Bank Agenda*. Africa Technical Department. August. 107p., Washington, DC: World Bank.

Section 3.0

3.1 Agriculture: Soil and Water Resources, including Irrigation

Altieri, Miguel. 1988. *Environmentally Sound Small-Scale Agricultural Projects*. Revised edition. Arlington, Virginia: CODEL and VITA.

Desai, G.M. 1990. *Fertilizer Policy Issues and Sustainable Agricultural Growth in Developing Countries*. Technology Policy for Sustainable Agricultural Growth. IFPRI Policy Brief No. 7. Washington, DC: International Food Policy Research Institute.

Erdmann, Thomas. 1992. *An Analysis of Ten African Natural Resource Management Practices*. Washington, DC: USAID and the Forestry Support Program (FSP).

Office of Technology Assessment. 1987. *Enhancing Agriculture in Africa. A Role For Development Assistance*. Washington, DC: Office of Technology Assessment.

National Research Council. 1994. *Vetiver Grass: The Thin Green Line Against Erosion*. Washington, DC: National Academy of Sciences Press.

Tillman, Gus. 1981. *Environmentally Sound Small-Scale Water Projects*. Arlington, Virginia: CODEL and VITA.

3.2 Timber Harvesting and Production

Arnold, J. E. M. 1994. *Non Farm Employment in Small scale Forest based Enterprises: Policy and Environmental Issues*. Oxford, England: Oxford University, Forest Institute.

Evans, Williams. 1990. "Timber Production in Cameroon, West Africa." Draft Report. Washington, DC.

Ffolliott, Peter, and Thames, J. 1983. *Environmentally Sound Small-Scale Forestry Projects*. Arlington, Virginia: CODEL and VITA.

Forest Stewardship Council. 1994. *Principles and Criteria For Natural Forest Management.* Oaxaca, Mexico.

United Nations Development Program. 1987. *Forest Based Rural Enterprises: Pakistan*. Bangkok, Thailand: FAO Regional Office for Asia and the Pacific.

USAID. 1992. *(Draft) Environmental Assessment Content Guidelines—22 CFR Par 216 and Section 533 for Environmental Assessments Involving Timber Extraction*. Bureau for Latin America and the Caribbean. Washington, DC: USAID.

World Resources Institute (WRI). 1993. *Surviving the Cut: Natural Forest Management in the Tropics*. Washington, DC: WRI.

3.3 Livestock and Range Management

Jacobs, Linda. 1986. *Environmentally Sound Small-Scale Livestock Projects.* Arlington, Virginia: CODEL and VITA.

Johnston, George, et al. 1992. *A Policy Taxonomy and Analysis of Policies Affecting Natural Resources and the Environment*. Bethesda, MD: Abt Associates and the Agricultural Policy Analysis Project, Phase II.

Kiss, Agnes. 1990. *Living With Wildlife: Wildlife Resource Management With Local Participation in Africa*. Washington, DC: International Bank For Reconstruction and Development. November.

Mkanda, F. X., and Munthali, S. M. 1992. *Public Attitudes and Needs Around Kasungu National Park, Malawi.* Lilongwe, Malawi: Malawi Department of National Parks and Wildlife.

Wildlife Conservation Society. 1993. *Proposal for an Impact Monitoring Program for the Masoala National Park in Madagascar*. New York: Wildlife Conservation Society.

3.4 Fisheries Management

DANIDA. 1989. *Environmental Issues in Fisheries Development.* Helsinki, Finland: Department of International Cooperation.

International Union for the Conservation of Nature. 1993. *Global Marine Biological Diversity. A Strategy For Building Conservation Into Decision Making.* Washington, DC: Island Press.

United Nations Development Program. Food and Agricultural Organization. 1994. *Fish For Food and Development. Strategy and Action Programs For Fisheries.* Rome: Food and Agricultural Organization.

United Nations Development Program. 1989. *Review of the State of World Fishery Resources.* Rome: Marine Resources Service, Fisheries Department.

Shumway, Carolyn. 1993. *Forgotten Waters: Freshwater and Marine Ecosystems in Africa. Strategies For Biodiversity Conservation and Sustainable Development*. Washington, DC: USAID.

3.5 Ecotourism

Boo, Elizabeth. 1990. *Ecotourism: The Potentials and Pitfalls.* Volume I. Washington, DC: World Wildlife Fund.

Booth, Greg and Roop, R. 1994. *An Assessment of Ecotourism Associated With Bao Bolon and Kiang West National Park in the Gambia.* Banjul, Gambia: USAID.

International Resources Group. 1992. *Ecotourism: A Viable Alternative For Sustainable Management of Natural Resources in Africa*. Washington, DC: International Resources Group.

Lindberg, K. and Hawkins, D. E., eds. 1993. *Ecotourism: A Guide for Planners and Managers.* North Bennington, Vermont: The Ecotourism Society.

3.6 Small-scale Rural Enterprises

Harza Engineering Company. 1980. *Environmental Design Considerations for Rural Development Projects.* Washington, DC: USAID.

Page, J. M., Jr. and Steel, W. 1984. *Small Enterprise Development. Economic Issues From African Experience.* World Bank Technical Paper 26. Washington, DC: World Bank.

3.7 Small Industry

African Development Bank. 1994. *Technical Report. Environmental Sectorial Policy Guidelines For The Industrial Sector.* Abidjan, Côte d'Ivoire.

3.8 Rural Roads

Harza Engineering Company. 1980. *Environmental Design Considerations for Rural Development Projects*. Washington, DC: USAID.

World Bank. 1994. *Roads and the Environment: A Handbook*. Report TWU 13. Washington, DC: World Bank Transportation, Water & Urban Development Dept. 167 pp.

3.9 Energy

African Development Bank. 1994c. (Draft) *Energy and Environment Project. Checklist for National Surveys on the Environmental Impacts of Energy Systems*. Abidjan, *Côte d'Ivoire*.

Bassan, Elizabeth, and Wood, T. 1985. *Environmentally Sound Small-Scale Energy Projects*. Arlington, Virginia: CODEL and VITA.

Bokalders, V., and Kristoferson, L. 1991. *Renewable Energy Technologies. Their Applications in Developing Countries.* Intermediate Technology Publications. London, England: Southampton Row.

Daystar, Inc. 1991. *Working Safely With Photovoltaic Systems*. Las Cruces, New Mexico: Daystar, Inc.

United Nations Development Program. 1992. *Environmentally Sound Energy Options For Africa.* Final Statement of the African Energy Experts Meeting Nairobi, Kenya (May 18-20). Nairobi, Kenya: United Nations Development Program.

USAID. Bureau for Research and Development, Office of Energy and Infrastructure. 1988. *Renewable Energy for Agriculture and Health*. Washington, DC: USAID.

3.10 Agroforestry

African Development Bank. 1994a. (Draft) *Technical Guidelines For The Implementation of Forest Policy in Africa*. Abidjan, Ivory Coast.

Bayle, Bruce, et al. 1992. *Strengthening Environmental Procedures under 22 CFR 216 to Address Section 533(C)(3) of the Foreign Assistance Act Related to Tropical Forests and Biological Diversity*. Washington, DC: USAID.

Huke, Susan, and Plecan, J. 1987. *Planning For Agroforestry*. Westport, Connecticut: Save the Children.

International Tropical Timber Organization. (Undated). *ITTO Guidelines For The Establishment and Sustainable Management of Planted Tropical Forests*. Yokohama, Japan: International Tropical Timber Organization.

Ogden, Cynthia, and Koppell, C. 1991. *Guidelines for Integrating Nutrition Concerns into Forestry Projects*. Rome: Food and Agriculture Organization.

Russo, Sandra. 1994. *Consideration of Biological Diversity and Tropical Forestry in the Context of Country Program Strategy Planning in the Bureau for Africa: Review and Guidelines.* Environmental and Natural Resources Policy and Training Project. Arlington, Virginia: USAID.

Serageldin, Ismail. 1993. *Saving Africa's Rain Forests. Environmentally Sustainable Development*. The World Bank. Washington, DC.

Sharma, Narendra. 1992. *Managing The World's Forests. Looking For Balance Between Conservation and Development*. Dubuque, Iowa: Kendall/Hunt Publishing Company.

Tropical Forestry Foundation. 1994. Newsletter Article on Conference on Tropical Forest Hardwoods. Washington, DC.

World Bank. 1991. *Forestry Development: A Review of Bank Experience*. Washington, DC: World Bank Operations Office.

3.11 Integrated Conservation and Development Programs

African Wildlife. 1995. *Agencies Race to Ease Virunga National Park Crisis.* January-February, Vol. 4, No. 1.

Biodiversity Support Program. 1994. *Kiang West National Park--An Integrated Conservation and Village Development Project.* Washington, DC.

_____. 1993. *African Biodiversity: Foundation for The Future*. Washington, DC.

Booth, Greg. 1993. *Biodiversity Impact Indicators within a Natural Resources Management Framework for sub Saharan Africa.* Washington, DC: USAID.

Brown, Michael, and Wyckoff-Baird, B. 1992. *Designing Integrated Conservation and Development Projects*. Washington, DC: Biodiversity Support Program.

Noss, Reed. 1989. "Indicators For Monitoring Biodiversity: A Hierarchical Approach." *Conservation Biology*, No. 4 (December).

USAID, Bureau for Africa, Office of Analysis, Research, and Technical Support. 1991. *A Conceptual Approach to the Conservation and Management of Natural Resources in Sub-Saharan Africa (Arid and Semi-Arid Forest and Woodlands).* Burlington, Vermont: Associates in Rural Development, Inc.

World Wildlife Fund. 1994. *Initiative on Participatory Monitoring and Evaluation of Conservation and Development Projects.* Washington, DC: World Wildlife Fund.

World Bank. 1992. *Conservation of West and Central African Rainforests*. Washington, DC: World Bank.

Zucrow, Barbara, and Keefe, W., eds. 1986. *Partners in Development: An Operational Manual for the Somalia Development Partners Projects*. Mogadishu, Somalia: USAID/Somalia.

3.12 Agricultural Pest Management

Altieri, Miguel. 1995. *Biodiversity and Pest Management in Agroecosystems*. New York: Food Products Press.

Arnold, Edward. 1992. *The BMA Guide to Pesticides, Chemicals, and Health*. London, England: Edward Arnold.

Bottrell, D. G. 1979. *Integrated Pest Management*. Council on Environmental Quality. Washington, DC.

Chiri, Angel, Pareja, M., Fano, H., and Urdinola, M. 1995. *Mid-term Evaluation: Integrated Pest Management for Andean Communities (MIPANDES)*. CARE - Peru.

De Bach, Paul. 1974. *Biological Control by Natural Enemies*. Cambridge, Massachusetts: Cambridge University Press.

Matteson, Patricia, Ferraro, P., and Knausenberger., W. I. 1995. *Pesticide Use and Pest Management in Madagascar: Subsector Review and Programmatic Environmental Assessment.* Report prepared for USAID/Madagascar. Arlington, Virginia: EPAT/Winrock International Environmental Alliance. 131 pp.

Davies, John E., Freed, V. H. and Whittemore, F. W. 1982. *An Agromedical Approach to Pesticide Management: Some Health and Environmental Considerations.* Miami, Florida: University of Miami School of Medicine. 320 pp.

Fisher, Herbert H., Matteson, P. C. and Knausenberger, W. I. 1994. *Supplemental Environmental Assessment of Pest Manage-*

ment and Pesticide Use in the Private Voluntary Organization Support Project of USAID/Mozambique. Volume I. USAID/ Mozambique report. 103 pp.

IPM Working Group Secretariat. 1994. *Regional Integrated Pest Management Activity Survey for sub-Saharan Africa: Summary of Survey Findings*. Chatham, Kent. United Kingdom. 8 pp + appendices.

Natural Resources Institute. 1992. *A Synopsis of Integrated Pest Management in Developing Countries in the Tropics*. Kent, England: Natural Resources Institute.

Matteson, Patricia C., Altieri, M. A., and Gagné, W. C. 1984. *Modification of Small Farmer Practices for Better Pest Management*. Annu. Rev. Entomol. 29:383-402.

McNeil, Jeremy N. 1991. *Behavioral Ecology of Pheromone-mediated Communication in Moths and Its Importance in the Use of Pheromone Traps*. Annu. Rev. Entomol. 36:407-30.

Overholt, W. and Castleton, C. 1989. *Pesticide User's Guide - A Handbook for African Extension Workers*. African Emergency Locust/Grasshopper Project 698-0517. B ureau for Africa's Office of Technical Resources. Washington, DC: USAID.

Pedigo, Larry P., Hutchins, S. H., and Higley, L. G. 1986. *Economic Injury Levels in Theory and Practice*. Annu. Rev. Entomol. 31:341-68

Pedigo, Larry P. and Higley, L. 1992. *The Economic Injury Level Concept and Environmental Quality*. Amer. Entomol. 38(1): 12-21.

Pimentel, D. P., Acquay, H., Biltonen, M., Rice, P., Silva, M., Nelson, J., Lipner, V., Giordano, S., Horowitz, A., and D'Amore, M. 1992. *Environmental and Economic Costs of Pesticide Use*. BioScience. 42(10):750-60.

Showler, Allan T. 1995. *Locust (Orthoptera: Acrididae) Outbreak in Africa and Asia, 1992-1994: An Overview*. Amer. Entomol. 41(3):179-185.

Southwood, T. R. E. 1978. *Ecological Methods: With Particular Reference to the Study of Insect Populations*. New York: Chapman and Hall.

Thurston, D. H. 1990. *Plant Disease Management Practices of Traditional Farmers*. Plant Disease. 74(2):96-102.

USEPA. 1990. *Suspended, Cancelled, and Restricted Pesticides*. Washington, DC: USEPA.

USAID, Bureau for Africa, Office of Analysis, Research, and Technical Support. Office of New Initiatives. 1992. Project Paper: Onchocerciasis Control Program, Phase IV. Washington, DC: USAID.

WRI. 1996. Partnerships for Safe and Sustainable Agriculture. Washington, DC: World Resources Institute.

3.13 Water Supply and Sanitation

African Development Bank. 1991. *Guidelines for Project Preparation and Appraisal in the Water Supply and Sanitation Sector*. Abidjan, Côte d'Ivoire: African Development Bank.

Bergey, Michael. 1991. *Wind-Electric Water Pumping in Naima, Morocco: A Case Study*. Washington, DC: USAID.

Harza Engineering Company. 1980. *Environmental Design Considerations for Rural Development Projects*. Washington, DC: USAID. A manual for identifying potential societal benefits and undesirable environmental impacts that may accompany small rural projects. The sectors covered are: roads; electrification; water supply and sanitation; irrigation and on-farm water management; and small industries. *To order*: US Agency for International Development, Center for Development Information and Evaluation, Washington, DC 20523.

U.S. Agency for International Development. 1992. *Facing the Challenge of Water Supply and Sanitation Goals*. Arlington, Virginia: Wa-

ter and Sanitation for Health Project (WASH).

Wyatt, Alan, et al. 1992. *Environmental Guidelines For PVOs and NGOs: Potable Water Sanitation Projects*. U.S. Agency For International Development. Arlington, Virginia: Water and Sanitation for Health Project (WASH).

3.14 Construction

Altieri, Miguel. 1994. *Biodiversity and Pest Management in Agroecosystems.* New York: Haworth Press.

Asian Development Bank. 1987. *Environmental Guidelines for the Implementation of Rural Development Projects.*

Brandon, Katrina, and Wells, M. 1992. *People and Parks Linking Protected Area Management With Local Communities*. Washington, DC:International Bank For Reconstruction.

3.15 Waste Management

U.S. Environmental Protection Agency. 1992. *Pesticides Waste Disposal*. Technical Information Package Series (TIPS). Washington, DC: USEPA. Document no. EPA/600/M-91/028.

3.16 Environmental Mitigation during Refugee Relief

Jacobsen, Karen. 1994. The Impact of Refugees on the Environment: A Review of the Evidence. Refugee Policy Group. Washington, DC: Center for Policy Analysis and Research on Refugee Issues. 49 pp.

Lind, Linda, and Peniston, B. (Undated). *Forestry Projects For Refugees and Displaced Persons.* Washington, DC.

3.17 Resettlement Activities and the Environment

McMillan, D., Painter, M., and Scudder, T. 1990. Land Settlement Review. Settlement Experiences and Development Strategies in the Onchocerciasis Control Programme Areas of West Africa. Binghamton, New York: Institute of Development Anthropology.

USAID, Bureau for Africa, Office of Analysis, Research, and Technical Support. 1993c. *Programmatic Environmental Assessment (PEA) of the USAID/Mozambique Transition Program Development Activities Related to Re-Integration, Rehabilitation and Reconstruction.* Maputo, Mozambique: USAID.

3.18 Food Aid, Humanitarian Relief and the Environment

Catterson, Thomas, et al. *Natural Resource Management and Program Food Aid in Niger*. Bethesda, Maryland: Agricultural Policy Analysis Project, Phase II.

Catterson, Thomas, Buccowich, M., and Helin, W. 1994. *Natural Resources Management and Title II Food Aid: An Evaluation*. Report submitted to USAID/Ethiopia. October. Washington, DC: U.S. Forest Service.

United Nations Development Program. Humanitarian Coordination Relief. 1994. *Environmental Assessment Report of The Rwandese Refugee Camps and the Affected Local Communities in Kagera Region, Tanzania.* Dar Es Salaam, Tanzania: United Nations.

U.S. Agency for International Development. (Undated). *The Use of Food Aid in Promoting Sustainable Natural Resource Interventions in Africa.* Workshop Proceedings. Washington, DC: USAID.

Section 5. Environmental Assessment Principles and Procedures

Arata, Andrew, and Breeland, S. 1987. "*Manual for Preparation of Initial Environmental Evaluations (IEEs) and Environmental Assessments (EAs) of USAID Projects for the Control of Vector-Borne Diseases*." Draft document. Arlington, VA: Vector Biology Control Project for USAID.

Bureau of Land Management. 1987. *Special Recreation Permits for Commercial Use.* Manual Transmission Sheet No. H-8372-1. Washington, DC.

CCIC. 1990. Environmental Screening of NGO Development Projects. An Introduction. Ottawa, Ontario: Canadian Council for International Co-operation. 23 p.

Chew, Siew Tuan. 1988. *Environmental Assessments of Development Projects.* Finland: Department of International Cooperation.

Environment and Natural Resources Information Center (ENRIC). 1993. *Environmental Assessment in USAID—Internal Working Document.* Unpublished.

Hecht, Joy, et al. 1992. *Environmental Assessment in Africa*. Washington, DC: International Resources Group.

Knausenberger, Walter. 1993. *Scoping Statement and Background Paper: Programmatic Environmental Assessment (PEA) of the USAID/ Mozambique Transition Program Development Activities Related to Re-Integration, Rehabilitation, and Reconstruction*. Washington, DC: USAID.

_____. 1993. *Somalia Recovery and Rehabilitation Assistance Project: Initial Environmental Examination*. Washington, D.C.: USAID.

Russo, Sandra. 1994. Consideration of Biological Diversity and Tropical Forestry in the Context of Country Program Strategic Planning in the Bureau for Africa: Review and Guidelines. Arlington, Virginia: EPAT/Winrock Environmental Alliance.

Samba, Idrissa. 1992. *Summary Guidelines for Preparing an IEE, EA, or EIS*. From the Mission Environmental Officers training session, March 9-11, 1992. Abidjan, Ivory Coast: USAID.

Stuart, Colin. 1991. Assessing the Environmental Impact of Small Projects. Coady International Inst. Newsletter Vol. 11 (1, 5-8).

USAID. 1996. Facilitators' Guide. Africa RegionalEnvironmental Assessment Training Course. Winrock International Environmental Alliance.

USAID. 1996. Participants' Sourcebook. Africa Regional Environmental Assessment Training Course. Winrock International Environmental Alliance.

World Bank. 1991. *Environmental Assessment Sourcebook.* 3 volumes. Washington, DC: World Bank Environment Department. Volume I: Policies, Procedures, and Cross-sectoral Issues; Volume II: Sectoral Guidelines; Volume III: Guidelines for Environmental Assessment of Energy and Industry Projects.

Appendix A

Classification of Project Activities during Activity Planning and Initial Environmental Examination

EXEMPTIONS

- International disaster assistance;
- Other emergency situations [requires Administrator or Assistant Administrator formal approval]; and consultation with CEQ];
- Circumstances with exceptional foreign policy sensitivities [requires Administrator formal approval, and consultation with CEQ]; and
- Emergency food aid programs under P.L. 480 - -Title II

Note: Exemptions are not applicable to assistance for the procurement or use of pesticides; "assistance for procurement or use" is interpreted broadly to include transport of pesticides or control equipment, disposal or ancillary support. [22 CFR §216.2 (b)]

CATEGORICAL EXCLUSIONS

Includes most **Category 1** activities as defined by USAID Bureau for Africa (Section 5.3).

Criteria for actions for which an IEE, EA or EIS generally are not required. Requires a written justification statement and approval by the Bureau Environmental Officer: CEs are not automatically granted. The justification must show how they fit the criteria for the CE and by what reasoning no adverse environmental impact will result. In substance, the request for a CE is very similar to a request for a negative determination in an IEE. For this reason, CEs are often treated on the same form as the IEE. The following key criteria apply:

- The action does not have an effect on the natural or physical environment
- USAID does not have knowledge of or control over ... details of the specific activities that have an effect on the physical and natural environment for which financing is provided by USAID
- Research activities that may have an effect on the physical and natural environment but will not have a significant effect as a result of limited scope, carefully controlled nature and effective monitoring. Activities involving genetic manipulation or pesticide use or procurement are not eligible for CEs.

Note: Various caveats and nuances limiting the application of categorical exclusions are contained in Reg. 16, reproduced in Appendix E.

Classes of Actions not Subject to the Procedures (22 CFR §216.2 (c)(2)):

- Education, training, or technical assistance;
- Controlled experimental research of limited scope and carefully monitored;
- Analysis, studies, workshops, meetings;
- Projects in which USAID is a minor donor;
- Documents or information transfer;
- Contributions to international, regional, or national organizations not for the purpose of implementing specifically identifiable activities;
- Institution-building grants to research and educational institutions in the United States;
- Nutrition, health, population, and family planning activities, except for their construction components and other activities directly affecting the environment;
- Commodity Import Programs, when USAID has no knowledge of or control over use;

- Support to intermediate credit institutions if USAID does not review or approve loans;
- Maternal or child feeding programs under Title II of P.L. 480;
- Food for development programs under Title III, USAID has no specific knowledge or control;
- Grants to PVOs when USAID has no specific knowledge or control;
- Studies or projects that develop the capability of countries to engage in development planning, except those resulting in activities directly affecting the environment; and
- Activities that involve the application of USAID-approved design criteria.

Note: Categorical exclusions are not applicable to assistance for the procurement or use of pesticides; assistance for procurement or use is interpreted to include transport of pesticides or control equipment, disposal or ancillary support.

SIGNIFICANT ENVIRONMENTAL IMPACT

Equivalent to USAID/AFR's Categories 3 & 4, in part.

When classes of actions are considered *a priori* to have a high potential for adversely affecting the environment, they normally requiring an Environmental Assessment (EA) or Environmental Impact Statement (EIS), as appropriate [22 CFR §216.2(d)(2)], and no IEE need be prepared:

- Programs of river basin development;
- Irrigation or water management including dams;
- Agricultural land leveling;
- Drainage;
- Large scale agricultural mechanization;
- New lands development;
- Resettlement activities;
- Penetration road building or road improvement;
- Power plants;
- Industrial plants;
- Potable water and sewerage, unless small scale; (Note: size limit to be determined in IEE);
- Activities jeopardizing endangered and threatened plant and animal species and their critical habitat (wetlands, tropical forests, protected areas, and so forth); and
- Pesticides (assistance for procurement or use always requires an IEE, see 22 CFR §216.3 (b); and often an EA).

Note: See Appendix E-1: Text of Regulation 22 CFR Part 216 (Reg 16"), Section 216 (3) (a) (4) and (5), 216.5 and 216.6 for applicable procedures.

Negative Declaration [22 CFR §216.2 (a)(3)]:

"The USAID Assistant Administrator, or Administrator ... may make a Negative Declaration, in writing, that the Agency will not develop an Environmental Assessment or an Environmental Impact Statement regarding an action found to have a significant effect on the environment when (i) a substantial number of Environmental Assessments or Environmental Impact Statements relating to similar activities have been prepared in the past, if relevant to the proposed action, (ii) the Agency has previously prepared a programmatic Statement or Assessment covering the activity in question which has been considered in the development of such activity, or (iii) the Agency has developed design criteria for such an action which, if applied in the design of the action, will avoid a significant effect on the environment." This is rarely invoked.

NO SIGNIFICANT IMPACT: INITIAL ENVIRONMENTAL EXAMINATION (IEE):

For the "gray areas," when it is not obvious that an activity falls into one of the above categories, it is necessary to prepare an IEE to make that determination. Mission Environmental and Regional Environmental Officers can assist in the preparation of the

IEE. Bureau environmental officers normally make the **Threshold Decision** based on the IEE.

Negative Determination [22 CFR §216.3 (a)(2)]:

The cognizant Bureau or Office will record a negative determination if the proposed action will not have a significant effect on the environment, usually associated with monitoring and mitigation actions needed. Includes most USAID/AFR **Category 2** and some **Category 3** activities.

Positive Determination [22 CFR §216.3 (a)(2)]:

The cognizant Bureau or Office will record a positive determination if the proposed action *will* have a significant effect on the environment. These normally would require an environmental assessment. Includes **Category 3** and all of **Category 4** as used by USAID/AFR.

When a threshold recommendation results in a Positive Determination, one of the following must be conducted:

- Environmental Assessment (EA); generally site specific, single class of action.
- Programmatic EA (PEA): generally non-site-specific, several classes of action.
- Environmental Impact Statement (EIS): Agency actions significantly affecting the global commons or the territory of the U.S.

Deferral [22 CFR §216.3 (1)(iii)]

Activities not identified in sufficient detail to permit completion of an IEE with the program document shall be described in the program document and include:

- an explanation indicating why the Initial Environmental Examination cannot be completed;
- an estimate of the amount of time required to complete the Initial Environmental Examination;
- a recommendation that a threshold decision be deferred until the Initial Environmental Examination is completed; and
- No activities may proceed until an environmental review is completed.

AppendixB

Environmental Screening Form: NGO Umbrella Project Subgrants

BACKGROUND

USAID, as a "re-engineered, learning institution," has introduced major changes in its operations, with a strengthened focus on results (not activities), greater accountability and empowerment, teamwork, participation, and customer orientation. For example, projects are replaced with "results packages" and provide USAID's operating units and collaborators the flexibility they need to adapt to changes during implementation. The underlying rationale is to focus on results, while still managing inputs and monitoring outputs properly.

The Bureau of Africa Bureau Environmental Office, in conjunction with the Regional Environmental Offices, has developed an initiative for environmental management capacity building. This initiative supports USAID/AFR missions, their implementing agents and collaborators. An important rationale for this initiative is that the Bureau's environmental and legal staff anticipate providing enhanced flexibility to carry out environmental reviews to those USAID mission programs whose designers and/or implementors have successfully completed an EA course and/or participated in related capacity-building activities.

Relevant agency experience has shown that enhanced responsibility can greatly facilitate field-level program design and implementation. The present Environmental Guidelines are consistent with USAID's new precepts of flexibility.

The present Environmental Screening and Reporting Form (ESF) is designed to be consistent with the Initial Environmental Examination process, and to assist USAID Missions and their implementing partners design and implement activities in an environmentally sound manner in accordance with all salient agency policies and procedures. Use of the ESF will reduce the need for review and approval of NGO subgrant activities at the regional or Washington levels.

HOW TO USE THIS FORM

This form can be utilized to screen proposals from applicants for subgrants under USAID funding, including grantees of PVO umbrella projects and proposals submitted for consideration for funding under other USAID programs including grants management units.

This is a generic form and is illustrative only. Its final contents can be refined and jointly determined among the affected partners—NGO, USAID, host-country agencies, etc. To the extent possible, the form should reflect host-government environmental policies and procedures; it should take into account existing designated protected areas.

The form will typically be useful in two broad categories of projects: (a) those designed to strengthen local institutional capacities to manage the natural resource base; and (b) those designed to support the development of appropriate infrastructure needed for sustainable natural resource management. Activities to be screened could include training, technical assistance and other institutional support, income-generating activities through the exploitation of natural resources in a self-sustaining and environmentally sound manner or development of physical infrastructure to further the management of the natural resources base at the district level.

Changes and adjustments in the form can be made in consultation with the regional and Bureau environmental offices. It is strongly advised that the mission environmental officer make on-site visits prior to finalization of the Mission ESF, and that the ESF be rational and fully defensible and without ambiguity as to how the conclusion was reached that the activity(ies) will have no significant impact.

Environmental Screening/Report Form

For NGO/PVO Activities and Grant Proposals

PVO/NGO(Grantee): _____

Grant/Subgrant to PVO/NGO: _____

Grant/Activity Name: _____

Duration (proposed start and completion dates): _____

Geographic Location: _____

Activity Description (paragraph(s) describing purpose/outputs and potential environmental impacts):

[add space as needed]

Step 1. Determine Nature of Activity/Grant:

a. **Environmental Review Report Needed.** Does the grant include funds to support any physical natural resource management activities, or any community and rural development services, infrastructure, public facilities or road rehabilitation? Does it involve development of income-generating or resource management systems, or certain kinds of applied ecological or natural resources research? If yes, an Environmental Review of the kind described in Step 5 of this form is likly required. Determine which Category the grant falls under, to establish the need for the Environmental Review.

b. **No Further Environmental Review Required.** Is the grant exclusively to provide technical assistance, training, institutional strengthening, or research, education, studies or other information analysis, awareness-building or dissemination activities *with no foreseeable negative impact on the biophysical environment*? Such grants probably qualify as a Category 1 activity—no further environmental review or action should be necessary. Complete form to establish this circumstance.

c. **Emergency Circumstances Apply.** Does the grant involve an emergency circumstance (e.g. drought)? Under specific conditions, the grant may be *exempt* from further environmental review. Must be determined by the Bureau Environmental Officer with input from the Regional and Mission Environmental Officers. Sound environmental implementation principles are to be applied to any urgent programs.

Exemptions *cannot* be applied in the case of assistance for use or procurement of *pesticides.*

d. **Multiple Categories.** Many grant proposals will have activities in more than one category. Simply mark all that apply. The form will guide you to the appropriate next steps.

Step 2. Determine Category of Grant:

■ ***Africa Bureau* Category 1 — *no further environmental review needed:***

♦ ***Does the grant involve (yes, no, N/A):***

_____ Provision of education, technical assistance, or training. Does not qualify for "Category 1" if such programs include activities directly affecting the environment.

_____ Community awareness initiatives.

_____ Controlled experimentation exclusively for the purpose of research and field evaluation confined to small areas (normally under 4 ha., i.e., 10 acres) and carefully monitored (when no protected or other sensitive environmental areas could be affected).

_____ Technical studies and analyses and other information-generation activities not involving intrusive sampling of endangered species or critical habitats.

_____ Document or information transfers.

_____ Nutrition, health care, or family planning. Such programs do not qualify for "Category 1" if (a) some included activities could directly affect the environment (construction, water supply systems, etc.) or (b) biohazardous (esp. HIV/AIDS) waste is handled or blood is tested.

_____ Rehabilitation of water points for domestic household use, shallow, hand-dug wells or small water storage devices (when no protected or other sensitive environmental areas could be affected).

_____ Construction or repair of facilities if total surface area to be disturbed is under 10,000 sq.ft. (approx. 1,000 sq.m.) (and when no protected or other sensitive environmental areas could be affected).

_____ Support for intermediate credit arrangements (when *no* significant biophysical environmental impact can reasonably be expected).

_____ Programs of maternal and child feeding conducted under Title II of Public Law 480.

_____ Food for Development programs under Title III of P.L. 480, when <u>no</u> on-the-ground biophysical interventions are likely.

_____ Studies or programs intended to develop the capability of recipients to engage in development planning. Do *not* mark "yes" if these involve activities directly affect the environment.

■ **Africa Bureau *Category 2* -- Negative environmental impacts possible, environmental review required (specific conditions, including monitoring, may be applied):**

Note: The Environmental Review (Step 5 below) must address why there will be no potential adverse impacts on protected areas, endangered or threatened species or their critical habitat; or relatively undegraded forest, i.e., justify your conclusion that the proposed Category 2 activities do not belong in Category 3 or 4. Even for activities designed to protect or restore natural resources, the potential for environmental harm exists (e.g., re-introduction of species, controlled burning, fencing, wildlife water points, spontaneous human population shifts in response to grant activities undertaken, etc.)

♦ ***Does the grant involve (yes, no, N/A)*:**

_____ Small-scale activities in agriculture, Natural Resources Manangement, sanitation, etc. (list and scale to be defined mutually among the appropriate partners—NGO, donor, host country agencies, REDSO, etc.).

_____ Controlled experimentation exclusively for the purpose of research and field evaluation *(*areas of 4 ha. or more, i.e., 10 acres) and carefully monitored, when neither protected or other sensitive environmental areas could be adversely affected nor threatened and endangered species and their habitat jeopardized.

_____ Small-scale construction or rehabilitation of facilities or structures in which the surface area to be disturbed exceeds 10,000 sq. ft and funding level is not in excess of $200,000 and where no protected or other sensitive environmental areas could be affected.

_____ Minor construction or rehabilitation of rural roads less than 10 km (with no change in alignment or right of way), with ecologically sensitive areas at least 100 m away from the road and not affected by construction or changes in drainage; likewise, no protected areas or relatively undegraded forest should be within 5 km of the road.

_____ Nutrition, health care, or family planning, *if* (a) some included activities could directly affect the environment (construction, water supply systems, etc.) or (b) biohazardous (esp. HIV/AIDS) waste is handled or blood is tested.

_____ Construction or rehabilitation of small-scale water points or water storage devices for domestic or non-domestic use, not covered in Category 1, when neither protected or other sensitive environmental areas could be adversely affected nor endangered and threatened species jeopardized.

_____ Quantity imports of commodities such as fertilizers.

_____ Food for Development programs under Title II or III, involving known biophysical interventions with potential to cause environmental harm (e.g., roads, bore holes).

_____ Support for intermediate credit institutions when indirect environmental harm conceivably could result.

_____ Institutional support grants to NGOs/PVOs when the activities of the organizations are known and raise the likelihood of some environmental impact.

_____ Technical studies and analyses and other information generation activities that could involve intrusive

sampling, including aerial surveys, of endangered species or critical habitats.

_____ Small-scale use of USEPA-registered least-toxic *general-use pesticides*, limited to NGO-supervised use by farmers, demonstration, training and education, or emergency assistance. Environmental review must be consistent with USAID Pesticide Procedures as required in Reg. 16 [22 CFR 216.3(b)(1)].

_____ Other activities not in Category 1 and not in Category 3 or 4. Specify: _____
_____

♦ ***Were the following used by the PVO/NGO in designing Category 2 activities (yes, no, N/A)?***

USAID/AFR's Environmental Guidelines for NGO and PVO Use in Africa

Any applicable Programmatic Environmental Assessments: _____
_____

Other(s):_____

■ Africa Bureau *Category 3* -- Significant environmental impacts likely. Environmental review required, and Environmental Assessment likely to be required:

♦ ***Does the grant involve (yes, no, N/A):***

_____ River basin or development of new lands.

_____ Planned resettlement of human populations.

_____ Penetration road building, or rehabilitation of roads (primary, secondary, some tertiary) over 10 km length, and any roads that may pass through or near relatively undegraded forest lands or other sensitive ecological areas.

_____ Substantial piped water supply and sewerage construction.

_____ Major bore hole or water-point construction.

_____ Large-scale irrigation.

_____ Water-management structures such as dams and impoundments.

_____ Large-scale agricultural mechanization.

_____ Agricultural land leveling.

_____ Procurement or use of restricted use pesticides, or wide-area application in nonemergency under nonsupervised conditions

_____ Light industrial plant production or processing (e.g., sawmill operation, agroindustrial processing of forestry products).

_____ Potential to degrade protected areas significantly such as introduction of exotic plants or animals.

_____ Potential to jeopardize threatened or endangered species or adversely modify their habitat (especially wetlands, tropical forests).

Category 3 activities are consistent with USAID criteria for activities that normally require a USAID-specific document with a defined format and procedure, called the Environmental Assessment (EA). It is recognized that some of these categories are ambiguous. Mark "yes" if they apply and show in the Environmental Review (Step 5) the extent and magnitude of activities and their impacts, so that USAID and its partners can determine if an EA is necessary.

- **Africa Bureau *Category 4* -- Activities not fundable or fundable only when specifically defined findings to avoid or mitigate the impacts are made, based on an Environmental Assessment**[1]:

  - ***Does the grant involve (yes, no, N/A):***

_____ Actions determined likely to degrade protected areas significantly, such as introduction of exotic plants or animals

_____ Actions determined likely to jeopardize threatened or endangered species or adversely modify their habitats (especially wetlands, tropical forests)[2].

_____ Conversion of forest lands to rearing of livestock.

_____ Planned colonization of forest lands.

_____ Procurement or use of timber-harvesting equipment.

_____ Commercial extraction of timber.

_____ Construction of dams or other water control structures which flood relatively undegraded forest lands.

_____ Construction, upgrading, or maintenance of roads (including temporary haul roads for logging or other extractive industries) that pass through relatively undegraded forest lands.

Step 3. Summarize and Itemize Activities. List activities under this grant by all categories to which *Yes* was answered.

Category of grant/subgrant activities as determined below (add entries as required):

Activity/Subactivity	Funding	Category

[1] Per Foreign Assistance Act Sect. 118 & 119 relating to overseas assistance affecting Tropical Forestry and Biodiversity

[2] Per USAID Environmental Procedures, § 22 CFR 216.5, on Endangered Species

Step 4. Determine Need to Prepare Environmental Review.

If all activities are in Category 1, sign and date the form. For any activities in Categories 2 and 3, prepare an Environmental Review Report assessing all of these activities' impacts. For Category 3 activities, further documentation will be required, once USAID has confirmed the applicability of Category 3, based on the Review. If Category 4 is possible, consult USAID before proceeding with the Environmental Review to determine if activities can be funded and/or whether required EA findings could be made.

For all Category 2 and 3 activities, proceed to Step 5 to prepare Environmental Review.

Step 5. Prepare Environmental Review

Suggested Format for Environmental Review

The Environmental Review should be about 3-5 pages (more if required) and consist of the following sections:

1. **Background, Rationale, and Outputs/Results Expected** -- summarize and cross-reference proposal if this review is contained therein.

2. **Activity Description** -- Succinctly describe location, siting, surroundings (include a map, even a sketch map). Provide both quantitative and qualitative information about actions needed during construction, how intervention will operate and any ancillary development activities that are required to build or operate the primary activity (e.g., road to a facility, need to quarry or excavate borrow material, need to lay utility pipes to connect with energy, water source or disposal point or any other activity needed to accomplish the primary one but in a different location). If various alternatives have been considered and rejected because the proposed activity is considered more environmentally sound, explain these.

3. **Environmental Situation** -- Affected environment, including essential baseline information available for all affected locations and sites, both primary and ancillary activities.

4. **Evaluation of Activities and Issues with Respect to Environmental Impact Potential** -- Include impacts that could occur before construction starts, during construction and during operation, as well as any problems that might arise with restoring or reusing the site, if the facility or activity were completed or ceased to exist. Explain direct, indirect, induced, and cumulative effects on various components of the environment (e.g., air, water, geology, soils, vegetation, wildlife, aquatic resources, historic, archaeological or other cultural resources, people and their communities, land use, traffic, waste disposal, water supply, energy, etc.). Indicate positive impacts and how the natural resources base will be sustainably improved.

5. **Environmental Mitigation Actions** (including **monitoring and evaluation**) -- For example, indicate means taken to avoid, reduce, or compensate for impacts, such as restoration of borrow or quarry areas, replanting of vegetation, or compensation for any relocation of homes and residents. Indicate how mitigative measures will be monitored to ensure that they accomplish their intended result or what monitoring might be needed for impacts that one is uncertain about.

6. **Other Information** (as appropriate) -- where possible, include photos of the site and surroundings; list the names of any reference materials or individuals consulted.

Note: Specific plans for monitoring of key environmental indicators and mitigation of impacts during activity implementation are especially important; these must be addressed in the review. Information on monitoring results and mitigation of impacts are to be included in all progress reports. Important information and a criterion for evaluation of environmental soundness is showing how the activity is part of or guided by an integrated, community-based resource and land-use plan or planning and management framework that considers the appropriate use of multiple resources.

Drafted by: _____ Date: _____

Reviewed by: _____ Date: _____

USAID PVO/NGO Grant Manager: _____

PVO/NGO Representative: _____

Clearances: (modify as appropriate)

USAID Activity/Program Administrator or Designee: _____

MEO (including recommendation that an EA be prepared, if called for)

USAID Mission Director

Other Mission officers (as appropriate)

REDSO REO, REDSO RLA (if appropriate)

Attachment: [applicable umbrella PVO project IEE]

Appendix C

Safe Pesticide Use Guidelines

The "safe pesticide use" paradigm is a common approach to mitigating the negative health impacts of pesticides. This paradigm promotes reducing health risks of pesticide use through safe use of the products. In the developing world, this often translates into promoting the use of personal protective equipment such as masks and protective clothing. Unfortunately, use of protective equipment alone does not always result in reduced health risk. This failure stems from many factors, including the lack of worker education regarding the dangers of pesticides, a lack of regulation or its enforcement, and inappropriate technology.

USAID'S PESTICIDE PROCEDURES

USAID's Pesticide Procedures derive from the only Environmental Impact Statement (EIS) thus far conducted on USAID's programs. The EIS was the result of a legal challenge to USAID's policies regarding the provision of pesticides, brought in 1975, by the Environmental Defense Fund and three other environmental NGOs. This EIS also stimulated the agency to develop comprehensive regulations governing environmental assessment of all its activities, known as the Environmental Procedures (22 CFR 216), or Reg. 16.

If USAID's resources are proposed for any activities that will involve assistance for the procurement or use, or both, of pesticides, planners must take into account these procedures. "Use" is interpreted broadly to include the handling, transport, storage, mixing, loading, application, clean up of spray equipment, and disposal of pesticides, as well as the provision of fuel for transport of pesticides, and providing technical assistance in pesticide management. In contrast, support to limited pesticide research and pesticide regulatory activities are not subject to scrutiny under the pesticide procedures.

USAID finances pesticides only on a case-by-case basis (and not on the basis of an approved commodity list) and then only after specific additional evaluation that would consider the potential benefits conferred by the use of the proposed pesticide. The kinds of factors to be considered in such an assessment should include, but not necessarily be limited to, the following (22 CFR 216.3 (b)(1)(i)(a-l):

- The USEPA's registration status of the requested pesticide(s);
- The basis for selection of the requested pesticide(s);
- The extent to which the proposed pesticide use is part of an IPM;
- The proposed method or methods of application, including availability of appropriate application and safety equipment;
- Any acute and long-term toxicological hazards, either human or environmental, associated with the proposed use and measures available to minimize such hazards;
- The effectiveness of the requested pesticide(s) for the proposed use;
- Compatibility of the proposed pesticide(s) with target and nontarget ecosystems;
- The conditions under which the pesticide(s) are to be used, including climate, flora, fauna, geography, hydrology, and soils;
- The availability and effectiveness of other pesticides or nonchemical management methods;

- The requesting country's ability to regulate or control the distribution, storage, use, and disposal of the requested pesticide(s);
- The provisions made for training of users and applicators; and,
- The provisions made for monitoring the use and effectiveness of the pesticide(s).

USAID's pesticide procedures require that any proposed use of pesticides be limited to products that are registered, without restrictions, for the same or similar uses in the U.S. by USEPA. Any proposed pesticide use that does not conform to such standards needs to be subject to an Environmental Assessment or Environmental Impact Statement. Pesticides cancelled or suspended by USEPA (Box C.1) are never approved for use in a USAID project. Similarly, products classified as Restricted Use Pesticides by USEPA (Box C.2) are almost never approved for use in USAID projects.

As an example, if a country requested financing for pesticides, it would be encouraged to use products registered for the same or similar uses in the United States. If no such products existed, the environmental review requirements would become progressively more stringent as one moved from previously registered to never registered pesticides (see Table C.1).

It is important to understand that in Box C.1, the term "restricted" refers to changes in product uses required by the USEPA as a condition to renew or reregister a product. In contrast, the pesticides listed in Box C.2 are those which, in the United States, may only be purchased or applied by well-trained and officially *certified* applicators or under their direct supervision on the basis of health and/or environmental risk criteria.

USAID recognizes that pesticides have a potential (though not necessarily primary) role in managing pests in developing countries. This observation has particular relevance to Africa. Many of its farmers use either no pesticides or egregiously "inappropriate" pesticides. Consequently, the availability of even small amounts of environmentally appropriate pesticides used properly might contribute to meaningful increases in production in a region that is especially prone to pest-related crop losses. Moreover, USAID's financing of selected pesticides in the context of an IPM system would help assure that USAID would have the opportunity to influence pest management strategies by remaining an actor in the process.

USAID recognizes that pest problems in developing countries do not mirror exactly those found in the United States. Whereas some pesticides might be entirely inappropriate for use in the United States and thus not registered with the USEPA, these pesticides might be ideal for tsetse flies or desert locusts in Africa. Similarly, developing countries have crops, diseases, habitats, and other pests that are not found in the United States. The implication, of course, is that the registration status of pesticides in the United States should not routinely or automatically apply to developing countries because the conditions in them are often considerably different than in the United States.

IPM is placed at the heart of USAID's intended pest management strategies. Other elements of USAID's strategy include: the strengthening of pest-management infrastructures in developing countries, improvements in schemes for regulation of pesticide usage, the monitoring of the human and environmental effects of pesticides, and efforts to exert a greater degree of U.S. leadership among the international community. Finally, USAID does not finance the procurement of pesticides through nonproject assistance (i.e., through its Commodity Import Program).

The use of *plant-derived pesticides* not registered with USEPA, such as nicotine-based commercial products, may not be promoted under a USAID project. Some botanical insecticides, such as infusions of ground rope tobacco and soap can result in a highly toxic product and should not be extended to smallholder farmers (Fisher et al 1994). A list of botanical insecticides currently registered by USEPA is shown in Table C.1.

Classification of Candidate Pesticides for Specific Evaluation

Categorization in terms of Proposed Use and USEPA Regulatory Status	Review Requirements in accordance with USAID Regulation 216
1. Pesticide to be used for research or limited field evaluation purposes only, irrespective of its current regulatory status in United States.	IEE[b]
2. Projects involving demonstration or use of pesticides for specified use:	IEE[b]
(a) Pesticide registered for same or similar uses[a] in the United States without restrictions.	IEE[b]
(b) Pesticide registered for same or similar uses[a] in United States, restricted on basis of user hazard.	IEE and, if approved, user hazard warning to and certification of awareness from recipient[b]
(c) Pesticide registered for same or similar uses[a] in the United States, restricted on basis of environmental hazard.	IEE plus EA or EIS[c]
(d) Pesticide registered for same or similar uses[a] but currently under presumption against reregistration, notice of intent to cancel, or subsequent notice of intent to suspend issued by USEPA.	IEE plus EA or EIS,[c] and, if approved, notice of impending action to recipient.
(e) Pesticide previously registered for same or similar uses[a] but cancelled for environmental hazard.	IEE plus EA or EIS[c]
(f) Pesticide previously registered for same or similar uses[a] but cancelled for health reasons.	IEE plus EA or EIS[c]
(g) Pesticide registered for a different use in United States.	IEE plus EA or EIS[c]
(h) Pesticide not registered for any use in United States, but tolerances established.	IEE plus EA or EIS[c]
(i) Pesticide not registered for any use in United States, no tolerances established.	IEE plus EA or EIS[c]

[a] Similar use is defined to include the use of a substantially similar formulation in a comparable use pattern. The term use pattern includes target pest, crop or animals treated, application site, and application technique, rate, and frequency.

[b] Pesticides in this category will not ordinarily be subject to further analysis; however, the decision to undertake such analysis will be made on a case-by-case basis.

[c] Pesticides in this category will, following the IEE, automatically trigger an EA as a minimum or an EIS, the choice of which will continue to be governed by USAID Regulation 216.

Abbreviations:

IEE -- Initial environmental examination; EA -- Environmental assessment; EIS -- Environmental impact statement; USEPA -- U.S. Environmental Protection Agency

Source: USAID 1976a in Tobin 1994.

Box C.1 Pesticides Cancelled or Suspended by USEPA

The following is a list of generic or accepted common names for pesticides—at least some of whose uses are suspended, cancelled, or restricted in the United States by the U.S. Environmental Protection Agency (USEPA). Note that thousands of trade names exist, few of which appear on this list. Carefully examine the label of any pesticide to ascertain whether the accepted common (or generic) name appears on this list.

Alar
Aldrin
Amitraz
Arsenic Trioxide
Benomyl
BHC
Bromoxynil
Bromoxynil Butyrate
Cadmium
Calcium Arsenate
Captafol
Captan
Carbon Tetrachloride
Chloranil
Chlordane
Chlordimeform
Chlorbenzilate
Copper Arsenate
Creosote
Cyanazine
Cyhexatin
Daminozide
DBCP
DDD (TDE)
DDT
2,4-D
Diallate
Dicofol
Dieldrin
Dimethoate
Dinocap
Dinoseb
EBDCs
EDB
Endrin
EPN
Fluoroacetamide
Heptachlor
Kepone
Lead Arsenate
Lindane
Mercury
Metaldehyde
Mirex
Monocrotophos
OMPA
10,10' Oxybisphenoxarsine
Oxyfluorfen
Parathion
PCNB
Pentachlorophenol
Phenarsazine Chloride
PCBs
Polychlorinated Terphenyls
Pronamide
Safrole
Silvex
Sodium Arsenate
Sodium Arsenite
Sodium Cyanide
Sodium Fluoride
Sodium Monofluoroacetate
Strobane
Strychnine
2,4,5-T
2,4,5-TCP
Thallium Sulfate
TOK
Toxaphene
Tributyltin
Trifluralin
Vinyl Chloride
Wood Preservatives: Calcium Arsenate, Creosote, Pentachlorophenol, Sodium Arsenate, and Sodium Arsenite

Source: USEPA, 1990.

Box C.2 Pesticides Classified as Restricted Use by USEPA[1]

Acetamide
Acetic acid
Acetochlor
Acrolein
Acrylonitrile
Alachlor
Aldicarb
Allyl alcohol
Alpha-clorohydrin
Aluminum phosphide
Amitraz
Amitrole
Arsenic acid
Arsenic pentoxide
Atrazine
Avermectin
Avitrol
Azinphos methyl

Bendiocarb
Benzoic acid
Biphentrhin
Bis (Tributyltin) oxide
Brodifacoum
Butylate

Cadmium chloride
Calcium cyanide
Carbofuran
Carbon dioxide
Carbon tetrachloride
Chlordane
Chlordimeform
Chlorfenvinphos
Chlorobenzilate
Chlorophacinone
Chloropicrin
Chlorothalonil
Chlorothoxyfos
Chlorpyrifos (EC on wheat)
Chromic acid
Clofentezine
Coal tar
Coal tar creosote
Copper oxychloride
Coumaphos
Creosote
Creosote oil
Cubé resins other than rote
Cupric oxide
Cuprous oxide
Cyanazine
Cycloheximide
Cyfluthrin
Cyhalothrin
Cypermethrin

DBCP
Deltamethrin
Demeton
Diallate
Diazinon
Dichloropropene
Diclofop methyl
Dicrotophos
Diflubenzuron
Dioxathion
Diphacinone
Disulfoton
Dodemorph

Endrin
EPN
EPTC
Ethion
Ethoprop
Ethyl parathion
Ethylene dibromide
Ethylene dichloride

Fenamiphos
Fenbutatin-oxide
Fenitrothion
Fenpropathrin
Fensulfothion
Fenthion
Fenvalerate
Flucythrinate
Fluoroacetamide
Fluvalinate
Fonofos

Hydrocyanic acid
Hydrogen cyanamide

Imazaquin
Isazofos
Isofenphos

Lambda-cyhalothrin
Lindane

Magnesium phosphide
Methamidophos
Methidathion
Methiocarb
Methomyl
Methyl bromide
Methyl isothiocyanate
Methyl parathion
Metolachlor
Mevinphos
Monocrotophos

Niclosamide
Nicotine
Nitrogen, liquid

Oxamyl
Oxidemeton methyl

Paraquat
Pentachlorophenol
Permethrin
Phorate
Phosacetim
Phosalone
Phosphamidon
Phostebupirin
Picloram
Picloram, isooctyl ester
Picloram, potassium salt
Picloram, triiosopropanolam
Piperonyl butoxide
Potassium pentachlorophenate
Profenophos
Pronamide
Propanoic acid
Propetamphos

Resmethrin
Rotanone

S-Fenvalerate
Simazine
Sodium arsenate
Sodium cyanide
Sodium dichromate
Sodium fluoroacetate
Sodium hydroxide
Sodium methyldithiocarbamate
Sodium pyroarsenate
Starlicide
Strychnine
Sulfotepp
Sulfuric acid
Sulfuryl fluoride
Sulprofos

Tefluthrin
TEPP
Terbufos
Tergitol
TFM
Toxaphene
Tralomethrin
Tributyltin fluoride
Tributyltin methacrylate
Trifluralin
Triphenyltin hydroxide

Zinc phosphide

[1] From USEPA's Restricted Use Pesticide (RUP) List, 12/06/95. This list contains only accepted common (generic) names. Trade names are far more numerous.

Table C.1 Botanical Insecticides Registered by EPA *

Insecticide name	Derivation	Registration	Toxicity Category	LD50 Oral/Dermal (mg/kg)
Azadirachtin	*Azadirachta indica*	'Align' on fruits/vegs roots, tubers; "Margosan" & others on ornamentals	IV	>5000/>2000
Capsaicin	*Capsicum frutescens*	'Hot Sauce' animal repellant	III	-/-
Garlic	*Allium sativum*	'Garlic Barrier' on vegs, citrus	-	-/-
Sesame oil	*Sesamum indicum*	'Sesamex': a pyrethrum synergist	III	2000 to 2270/-
Pyrethrum	*Chrysanthemum cinerariaefolium*	many products: stored food grains, pets	III	1500/.>1800
Ryania	*Ryania speciosa*	many products: citrus thrips, Eur. corn borer, codling moth	III	1200/-
Sabadilla	*Schoenocaulon* sp.		III	-/-
Rotenone	*Derris, Tephrosia, Lonchocarpus*	many products, garden dusts, animal ticks	III I	132 to 1500/- EC formulation

*From Fisher et al. 1994

Note: Hyphens indicate data are not available. See Table C.10 for the definitions of each toxicity category.

DESIGN CONSIDERATIONS FOR PESTICIDE MANAGEMENT AND SAFE USE

Introduction

Pests are organisms that compete with humans, domestic animals, or crops for nutritional resources. They include species of insects, mites, nematodes, mollusks, plant pathogens, vertebrates, and weeds. Their correct identification, as well as that of their natural enemies, is essential before decisions can be made regarding the necessity and suitable method of management.

The indiscriminate use of pesticides should be avoided. Although a pest may be present, its numbers may not be sufficient to justify using pesticides. Besides being expensive, pesticides can, if misused, create more problems than they solve. Using chemical pesticides alone will not necessarily produce better crops either. The best way to manage most pests is to use a combination of nonchemical techniques and selective pesticides.

IPM is an approach whereby appropriate existing management methods (cultural, biological, chemical, physical), mitigating factors, environmental concerns, climatic conditions, and ecosystem interrelationships are integrated to assist in decision making. See Appendix D for specific approaches to implementing IPM.

The following pesticide management topics are covered herein:

- Preparations for Pest Management Operations
  - Pest Monitoring and Survey
  - Cultural and Biological Control Methods
  - Examples of Nonchemical Pest Management Techniques
  - Village Brigades
- Safe Pesticide Use
  - Pesticide Selection
  - The Pesticide Label
  - Transport
  - Mixing and Loading
  - Pesticide Storage
  - Obsolete Pesticides and Containers
  - Sprayer Calibration
  - Determining the Amount of Chemical to Use
  - Applying Pesticides
  - Pesticide Toxicity and Human Protection
  - First Aid for Pesticide Overexposure

Preparations for Pest Management Operations

Prior to the main agricultural season, the farmer should ensure that the farm is equipped and prepared to face a pest infestation. Adequate preparation would include: working spray equipment, clean protective clothing and safety equipment, and the needed amount of pesticide carefully stored and ready for use. In addition, any crop protection service (CPS) field bases supporting village farmers should ensure that farmers are ready, both technically and materially, to face the coming season. In addition, a vulnerability assessment of crops threatened by the pest species (including relative importance of crops) and the crop stage of development will assist in deciding when and where a pesticide treatment may be needed.

Pest Monitoring and Survey

To help keep pest numbers below levels where economic crop loss can occur and to reduce the environmental impact of pesticide use, it is important to survey regularly. Pest surveying should begin early in the season and continue on a regular basis throughout the growing season. When necessary, control activities should be implemented promptly and in a carefully targeted way. Knowledge of the pest and crop ecology, along with equipment in good working order, help to accomplish this. A monitoring-based approached will typically reduce the number of pesticide treatments required by 40-60% during a regularly scheduled control scheme.

The main elements to be included in pest survey programs are: 1) knowledge of pest distribution in time and space; 2) monitoring of environmental conditions and changes that might lead to increased numbers of pest species. This will require some knowledge of pest species' biology, the status of environmental conditions, and how these conditions can be augmenting or limiting factors.

Village Brigades

A village brigade is a unit responsible for a village's pest monitoring and control needs. Brigades are being formed in many African countries as self-help units and decentralize the activities that the national CPS often conducts. These brigades are formed with the assistance of rural extension agents and the national CPS. A village brigade typically includes 10 interested and enthusiastic villagers. The participants receive three days of intensive pest and pesticide management training and are then issued a small quantity of pesticides, a set of protective clothing, and the necessary application equipment. Village brigade members are responsible for pest management at the village level and are supported by the farmers. The members of a village brigade can train an entire village during the year.

To the extent village brigades assume a significant role in pest management, they should be discouraged from becoming overly dependent on pesticides and encouraged to understand and promote the adoption of nonchemical control options as much as possible. Other brigade activities should include: coordination of area-wide rat-baiting programs, removal of pest and pathogen reservoirs, timely handpicking of egg masses of large pests, and implementation of other useful nonchemical management techniques requiring effective community mobilization.

Pesticides and Pesticide Safety

Pesticide safety begins with the selection of the correct product and continues through proper transportation, storage, mixing, loading, application, cleaning of application equipment, and disposal of the pesticide and its container. Pesticides can be grouped or classified by several different methods:

1. According to function (action against a specific pest category)

Pesticide	Pest Group
Acaricide/miticide	Mites, ticks
Bactericide	Bacteria
Fungicide	Fungi
Herbicide	Weeds
Insecticide	Insects
Molluscicide	Mollusks
Nematicide	Nematodes
Rodenticide	Rodents

2. Chemical Makeup

Groups	Examples
Organochlorines	DDT, dieldrin, aldrin, heptachlor, lindane (most of them cancelled in most countries)
Organophosphates	actellic, acephate, chlorpyrifos, dimethoate, endosulfan, malathion,
Carbamates	carbaryl, methomyl, propoxur,
Synthetic pyrethroids	bifenthrin, cyfluthrin, permethrin, cypermethrin, deltamethrin, fenvalerate
Botanicals	pyrethrin, rotenone, nicotine, azadirachtin (neem)
Microbials	*Bacillus thuringiensis*, *Heliothis* nuclear polyhedrosis virus, *Nosema locustae; Metarhizium flavide*
Petroleum oils	mineral oil
Insect growth regulators	diflubenzuron, methoprene

3. Formulation

Liquid:	Emulsifiable Concentrates (EC or E)
	Flowables (F or L)
	Solutions (S)
	Ultra Low Volume concentrates (ULV)
Dry:	Dusts (D)
	Granules (G)
	Pellets (P)
	Wettable Powders (WP)
	Soluble Powders (SP)
	Dry Flowables (DF)
Other:	Aerosols
	Fumigants
	Baits

Pesticide Selection

Once the decision is made to use a synthetic pesticide, the correct product must be selected. Factors to consider include the following:

- Is the product registered and recommended for managing the pest on the specific crop being grown? Do not use a pesticide on a crop for which it is not registered or recommended.
- What is the cost of the chemical, based not only on the initial unit cost but also the cost per application and the number of applications required?
- What is the pesticide's availability?
- What is the pesticide's relative toxicity and how hazardous is its use?
- What are the possible harmful effects of using the product?
- What is one's past experience in using the chemical for the pest and crop in question?

The Pesticide Label

The label is the printed material attached to the pesticide container. Never purchase a pesticide without an approved label attached to the container. The ability to read and understand this label is essential. Farmers should read the label:

- Before purchasing the pesticide to determine if the chemical will manage the pests on the crop in question and can be used safely for their specific conditions;
- Before mixing the pesticide to determine if they have the necessary protective clothing, how much pesticide to use, and how to mix it;
- Before applying the pesticide to learn the safety measures required, when to apply the pesticide, how to apply it, when it is safe to re-enter the treated area, when it is safe to harvest the treated crop, and what restrictions would prohibit its use under current conditions;
- Before storing the container to ensure safe and proper storage; and
- Before disposing of the container to ensure safe and proper disposal.

The pesticide label should contain:

USEPA or other registration number.

Brand name: Name assigned by the manufacturer.

Common name: Short name approved for the chemical's active ingredient (the material that actually kills the pest).

Chemical name: Name of the active ingredient, presented according to the rules of nomenclature used in *Chemical Abstracts*.

Ingredient statement: Lists the active ingredient or ingredients along with the percentage of inert or inactive ingredients.

Percentage active ingredient: For powders, "50% WP" contains 50% of active ingredient. For liquids, it is measured as pounds of active ingredient per gallon. "2 EC" is 2 pounds active ingredient per gallon of product.

Net contents: Shows the actual amount of product in the container.

Name and address of the manufacturer

Signal words and symbols: Product's quick reference as to relative toxicity to humans.

Precautionary statements: Given to protect users, others, animals, and the environment from damage resulting from using the pesticide.

Route of entry: A statement listing possible ways the pesticide can harm or enter a handler's body.

Specific action: Statements that help the handler prevent the routes of entry specified above.

Protective clothing and equipment: A statement that further explains how to prevent pesticide overexposure.

Practical treatment: Specifies the recommended first aid in the case of overexposure.

Environmental hazards: Explains how misuse of the product can harm the environment.

Special toxicity: Explains how to use the product without harming nontarget organisms such as honeybees, fish, birds, and other wildlife.

Physical or chemical hazards: Explains any special fire, explosion, or chemical hazards the chemical can pose during transportation or storage.

Reentry statement: Gives the time that must pass between application of the pesticide and when it is safe to reenter the treated area.

Storage and disposal: Outlines recommended methods.

Directions for use: Occupies a large area of the label. Lists crops, sites, and target pests for which the product is registered, along with recommended application rate, method of application, timing, any known compatibility or phytotoxic problems, and other use information. The days to withhold, or period between application and when the crop is safe to eat, is sometimes listed here.

In addition, the following list presents the main points to know and remember when using chemicals to manage pests:

- Use the recommended chemical, rate, and application method.
- Good coverage of all plant parts is essential, if spraying is on a "wet to runoff" basis.
- Some insecticides kill beneficial insects as well as harmful ones, so do not use them indiscriminately.
- Always read the directions on the container.
- Purchase and store pesticides in their original container. Keeping pesticides in containers that originally held food or drink has resulted in many accidental poisonings. Likewise, never reuse an empty pesticide container for any purpose, especially for storing food or water.

Transport

Pesticides should never be transported inside the passenger compartment of an automobile or truck cab but in the trunk or in the back of the truck. Check the truck bed to make certain there are no nails, bolts, screws, or other sharp objects that could puncture pesticide containers. Never transport pesticides with persons or animals. Never transport pesticides where they could come into contact with groceries, livestock feed, seed, or other products that might become contaminated. Pesticide containers should be well sealed and secured during transport to prevent spillage or loss if there are sudden starts, stops, or turns.

Mixing and Loading

Most pesticides are sold as concentrates that require dilution with a carrier, usually water, prior to application. Always read the label before mixing a pesticide. The label will tell how much to dilute the formulated product and how much of the mixture to apply per unit area.

It is essential to measure the exact amount of pesticide recommended. Applying lesser amounts usually does not manage the pest. Applying more than is recommended not only needlessly increases production costs but could also be harmful to the applicator and the environment. It could also make the crop unsafe to eat due to excessive pesticide residues. Pour the specified quantity of pesticide into the water. If stirring is necessary, use a stick and never hands.

Make sure all the protective clothing specified on the label is available and is used. Soap and water for washing should also be accessible. Should a pesticide spill or splash onto the farmer during mixing, the next two minutes are critical. Immediately remove clothing and wash thoroughly with soap and water.

Following the mixing process, securely close the containers and return them to storage. Wash all measuring and mixing containers and store. Wash all protective clothing and store any that is not required for application.

Pesticide Storage

A good storage area should have a fenced and covered area for the pesticides. A pesticide storage warehouse should:

- be secure against illegal entries and locked when not in use;
- be constructed in a site not exposed to floods;
- be isolated from dwellings in order to avoid fire, leakage, and water contamination;
- be supplied with water in order to clean spills and fight fire;
- be aerated to avoid toxic fume concentration;
- have a current inventory of pesticide stocks;
- have protection gear such as suits, boots, gloves, goggles, and breathing masks;
- have a first aid kit with antidotes; and
- be staffed with trained personnel familiar with measures to take in cases of poisoning.

A management system is needed to record the date each pesticide arrived at the facility, how long it stays in storage, and when it is removed for use. In addition, the storage requirements for each pesticide must be posted and known by the management staff. Stored pesticides must be tested periodically to insure that the active ingredient is as described on the label and that the formulation concentration is correct. Also the disposal of unused and obsolete pesticides, and the destruction of their containers, must be part of the management system.

Success of pest management campaigns depends on availability of pesticides in the areas that need treatment. Pesticides should be placed in a safe and secure storage area as close as possible to agricultural areas that will likely need treatment. Pesticide stocks must be securely in place at CPS bases and in villages before the rainy season.

Obsolete Pesticides and Container Disposal

All empty pesticide containers must be destroyed. It is extremely dangerous to use them for anything else. Consult the pesticide label, the manufacturer, or the manufacturer's representative for specific recommendations regarding container cleanup and disposal. The following are general guidelines.

There are two basic methods for cleaning pesticide containers. Both require that the container be turned upside down and allowed to drain into the spray tank for at least 30 seconds, followed by adding water to the container and rotating it well to wet all surfaces, then draining it again into the spray tank as an additional dilutent.

- Triple Rinse Method: Add a measured amount of water or other specified dilutent so that the container is one-fifth to one-fourth full. Rinse container thoroughly, pour into a tank, and allow to drain for 30 seconds. Repeat three times. The water rinsate can be used to mix with or dilute more of the same pesticides or it can be sprayed on the target crop.
- Pesticide Neutralization Method: Empty organophosphate and carbamate containers can be neutralized by adding alkaline substances. The following procedure is recommended for 200-liter barrels. Use proportionally less material for smaller containers.
    1. Add 20 liters of water, 250 milliliters of detergent, and one kilogram of flake lye or sodium hydroxide.
    2. Close the barrel and rotate to wet all surfaces.
    3. Let stand for 15 minutes.
    4. Drain completely and rinse twice with water. The rinsate should be drained into a shallow pit in the ground located far away from wells, surface water, or inhabited areas.

Containers cleaned by any of the above methods are still not safe to use for any other purpose. Glass containers should be broken and plastic or metal containers punctured or crushed. Containers can then be buried in an isolated area at least 50 cm below ground surface.

Pesticide Use: Calibration of Application Equipment

The calibration of spray equipment is the process through which the sprayer is adjusted to deliver the correct amount of pesticide, according to recommended rates as indicated by the manufacturer, in order to achieve the desired management of the target pest. Pesticides are generally mixed with water and the mixture is applied using some type of sprayer. Water is used as a dilutent or carrier to deliver the pesticide to the plant or other target area. An adequately equipped, maintained, and calibrated sprayer is essential for using pesticides effectively.

Determining the Application Rate: Three factors determine the rate at which many sprayers will deliver the spray mixture to a given area: (1) the size of the opening (orifice) in the nozzle tip through which the spray mixture passes, (2) the pressure used to force the spray mixture through the nozzle, and (3) the speed at which the sprayer travels over the area being sprayed.

Nozzle Tips: The nozzle regulates the flow rate, breaking up (atomizing) the mixture into droplets, and dispersing them in a specific pattern. Nozzles come in different types and orifice sizes. As orifice size increases so does the amount of spray mixture that passes through it in a given time period. It is important to check the calibration of the sprayer before each application involving a different spraying situation. If the orifice becomes badly worn the nozzle tip should be replaced.

Cone nozzles are the preferred type for applying fungicide and insecticide sprays where penetration and complete coverage of the plant foliage is important. Small, light weight droplets are produced that will drift readily. For this reason spraying should be done when calm conditions prevail. Cone nozzles are named for the spray pattern they produce, some producing a hollow cone and others a solid cone.

Pressure: The rate of spray application increases with the pressure. Gauges that measure pressure created by the spray pump are available for many backpack sprayers, but few are so equipped. Pressure gauges are not as important for insecticide and fungicide application as for herbicide use.

Speed of Travel: The time it takes to spray a given area must be determined when calibrating a sprayer. For applying fungicides and insecticides to row crops, this is the time it takes to thoroughly spray the crop plants for a predetermined distance of row. Usually it is recommended that crops be sprayed to the point that the spray just begins to drip from the foliage. Alternatively, one could determine the time required to spray a certain area, for example 10 sq. miles. This method is useful for crops planted broadcast.

Calibration: In order to calculate how much insecticide or fungicide material should be added to a given amount of water, one must first know how much water will be applied to a given area. Spray volume and pesticide rates are often expressed in terms of amounts required per hectare. In the following example we will use a small area to calibrate the sprayer and then convert this to liters per hectare.

For calibration for *crops planted in rows*:

1. Determine the space between rows (in cm) for the crop to be sprayed. Using this distance go to Table C.2 and select the length of row to be used in calibrating the sprayer. For example, if the row spacing is 90 cm the row length to be used in the calibration test is 11.1 m.
2. Select a section of a row having plants that best represent the average size of the crop to be sprayed. Then measure and mark off the distance obtained in Table C.2.
3. Make sure the sprayer is clean and in good working order. Fill the sprayer with clean water only. Do not use any spray chemicals for the calibration test.
4. Using a watch, determine how long it takes to spray the plants in the section of row that you marked off, working at the same pace you would normally use when spraying a crop.
5. Next, while standing still in a convenient location spray in the same manner as before and for the same length of time, but now collect the water by spraying into a suitable container. Then measure the water collected to determine how many ml were sprayed. If a cup to measure ml is not available, an empty cold drink can may be sub-

stituted. Measure the amount to the nearest 1/4 can. *Note: Do not use containers that will be used to prepare food in this step since small amounts of poisonous chemicals may remain in sprayers even after cleaning. In addition, never use empty pesticide containers to store food or water. Dispose of them properly.*

6. If you measured the water you collected in ml then the number of ml collected is equal to the number of liters per hectare.

   Example: If you collected 475 ml, the rate is 475 liters/ha. If you used a cold drink can to measure the water collected you can use Table C.3. to determine the spray volume per hectare.

   Example: If about 1.5 cans were collected, we can see from Table C.3 that the rate per hectare would be approximately 510 liters/ha.

For calibration of *crops not planted in rows*:

1. Select an area that best represents the average topography to be sprayed. Measure and mark a section 2 by 10 meters in size.
2. Follow step 3 above.
3. Determine the time (in seconds) it takes to spray the entire area (see step 4), and follow steps 5 and 6 above.

For calibrating without the use of a watch:

1. Follow steps 1 through 3 in the appropriate section above. If the crop to be sprayed is planted in rows follow section (a). If the crops are not in rows use section (b).
2. With this method it is necessary to have the sprayer even full when starting so that it can be refilled to the same level. Spray the plants in the section marked off, being careful to cover the plant surfaces well just until the spray begins to drip from the leaves.
3. Measure the amount of water required to refill the sprayer to the same level as before.
4. If you measured the water in ml, then the number of ml collected is equal to the number of liters required per treated hectare. If you used a cold drink can to refill the sprayer, go to Table A3.3 to determine the spray volume per hectare. For examples see step 6 above.

Table C.2 Select Calibration Distance to use Based on Row Spacing of Crop to be Sprayed

Row Spacing (cm)	Calibration Distance (m)
40	25.0
60	16.7
90	11.1
150	6.7

Table C.3 Determine Liters Per Hectare to Apply Based on Number of Cold Drink Cans of Water Collected

No. of cans collected	Volume/hectare (liters)
1/2	170
3/4	255
1	340
11/4	425
11/2	510
13/4	595
2	680
21/4	765
21/2	850

Determining the Amount of Chemical to Use

Adding the correct amount of chemical to each sprayer full of water is equally as important as correctly calibrating the sprayer. Recommended rates of chemical products that should be used to control important diseases and insects are given in various extension publications for particular crops. These often give the amount of chemical to be added to 5 liters of

water or to one spray tank. Some publications will list the amount of material to be applied per hectare. In this latter case, additional calculation is needed to determine the amount to be added to one sprayer tank. Two methods of doing this are given below:

Method 1: To obtain the fraction of a hectare that can be covered by one tankful of spray, divide the capacity of the sprayer tank by the number of liters per hectare from step 6 above

Example: If the sprayer holds 15 liters, then: 15 liters @ 475 liters/ha = .032 ha per tank. If you then multiply the recommended application rate per hectare for the fungicide or insecticide by the fraction of a hectare covered by one tankful, you will obtain the amount of chemical to add to one spray tank.

Example: If the recommended rate for the chemical is 2 kg per hectare, then: 2 kg/ha X .032 ha/tank = .064 kg (or 64 g).

Method 2: Table C.4 lists the amount of product to add to a 15-liter spray tank for various recommended rates per hectare of chemical product and several calculated spray volumes. For spray volumes not listed in the table use the one nearest your calculated amount.

Example: Two kg per hectare of chemical are recommended and in your calibration you have determined your spray volume to be 475 liters per hectare. Using Table C.4 you find that 475 liters per hectare is not listed. Since 500 liters is the closest amount, you look under that column and find that for 2 kg per hectare of chemical 6 match boxes (tablespoons) of the chemical should be added to each 15-liter spray tank.

Table C.4 Number of Tablespoons (1 level match box) of Chemical to Add to 15-Liter Spray Tank for Recommended Chemical Rates and Spray Volumes

Recommended chemical rate	Calibrated spray vol. (liters/ha)					
	250	300	400	500	600	700
(Number of matchboxes of chemical to be added to a 15-liter spray tank)						
Powders (kg/ha)						
1	6	5	4	3	2.5	2
2	12	10	8	6	5	4
3	18	15	12	9	7.5	6
4	24	20	16	12	10	8
5	30	25	20	15	13	10
Liquids (liters/ha)						
1	3	2.5	2	1.5	1	1
2	6	5	4	3	2.5	2
3	9	7.5	6	4.5	4	3
4	12	10	8	6	5	4
5	15	12.5	10	7.5	6	5

Example of how to use Table C.4

Recommended chemical rate	Calibrated spray vol. (liters/ha)					
	250	300	400	500	600	700
Powders (kg/ha)	(Number of matchboxes of chemical to be added to a 15-liter spray tank)					
1	6	5	4	3	2.5	2
2	12	10	8	6	5	4
3	18	15	12	9	7.5	6
4	24	20	16	12	10	8
5	30	25	20	15	13	10

Applying Pesticides

Avoid applying pesticide sprays or dusts when the wind continually moves leaves and small plants (approximately 4 meters/ second). If too much pesticide drifts away from the treatment area, there is a good chance the pests will not be managed well. In addition, the drifting pesticides can cause problems in other areas. Drift can harm the environment, affect populated areas, pollute waterways, and contaminate adjacent crops close to harvest.

Refrain from applying pesticides during the hottest part of the day. As a general rule, do not apply between the hours of 10 a.m. and 6 p.m. Avoid applying pesticides if you think it will rain within 12 hours.

Disposing of unwanted pesticides is difficult to do safely and is a potentially dangerous undertaking. Avoid this problem by purchasing only the quantity needed for a single season and mixing only the amount needed to treat the desired area.

Recommended protective clothing must be worn at all times. Do not eat, drink, or smoke or chew tobacco while applying pesticides. Tobacco will absorb pesticides. Do not carry tobacco, food, or drinks with you while spraying. Keep out of any spray drift and keep all others away from the area. If the nozzle gets plugged, do not try to blow it out with your mouth. Use a small brush or soft stick. *If you or a coworker show signs of pesticide poisoning, stop treatment immediately and begin first aid.*

After applying pesticides, wash all equipment and protective clothing and store them in a secure area. Wash face, hands, and other exposed parts of the body with soap and plenty of water. Wash all contaminated clothing separately from other clothing. As always, do not contaminate streams, ponds, or drinking water wells during cleanup. Fish are very susceptible to most pesticides. Never eat fish found dead.

Pesticide Toxicity and Human Protection

Toxicity is the inherent capacity of a substance to produce injury. Pesticide toxicity is determined by oral, dermal, and inhalation studies on test animals. The term *hazard* refers to the risk or danger of intoxication when a toxic substance is used. Pesticides vary in their toxicity to humans and are grouped into three categories. The relative toxicity of a pesticide is noted on its label by the signal word, as shown in Table C.5.

Table C.5 Relative Pesticide Toxicities Based on Signal Word on Pesticide Label

Signal word	Toxicity	Lethal (oral) dose (72 kg, man)*
Danger Poison**	Highly toxic	Few drops to 1 teaspoon
Warning	Moderately toxic	1 teaspoon to 1 tablespoon
Caution	Low toxicity	1 ounce to more than I pint

**Skull and crossbones symbol included.

*Less for a child or a person weighing less than 72 kg.

Farmers who use pesticides are clearly more exposed to these poisons than those who do not, hence it is crucial to keep such exposure to an absolute minimum. The potential impact can be minimized by following proper safety procedures. Most pesticide poisonings result from careless handling practices or from a lack of knowledge regarding the safe handling of pesticides. The time spent learning about safe procedures and how to use them is an investment in the health and safety of oneself, one's family, and others. Pesticides can enter the body in four major ways: through the skin, the mouth, the nose, and the eyes. A checklist is given below to help avoid these various routes of overexposure to pesticides.

For avoiding dermal exposure

- Check the label for special instructions or warnings regarding dermal exposure.

- Use recommended protective clothing and other equipment as listed on the label.
- Do not re-enter the area until deposit has dried or re-entry interval is past.

For avoiding oral exposure

- Check the label for special instructions or warnings regarding oral exposure.
- Never eat, drink, or smoke, chew tobacco while working with any pesticide.
- Wash thoroughly with soap and water before eating, drinking, smoking, or chewing tobacco.
- Do not touch lips to contaminated objects (such as nozzles).
- Do not wipe mouth with contaminated hands or clothing.
- Do not expose food, beverages, drinking vessels, or cigarettes to pesticides.
- Wear a face shield when handling concentrated pesticides.

For avoiding respiratory exposure

- Read the label to find out if respiratory protection is required.
- If respiratory protection is required, use only an approved respiratory device.
- Stay upwind during application.

For avoiding eye exposure

- Read the label to find out if eye protection is required.
- If eye protection is required use goggles to protect eyes or a face shield to protect eyes and face.
- Keep pesticide container below eye level when pouring.

A list of recommended protective clothing and equipment based on product formulation and label signal word is given in Table C.6.

BASIC FIRST AID FOR PESTICIDE OVEREXPOSURE

Get medical advice quickly if you or any of your fellow workers have unusual or unexplained symptoms during work or later the same day. Do not let yourself or anyone else get dangerously sick before calling a physician or going to a hospital. It is better to be too cautious than too late.

First aid is the initial effort to help a victim while medical help is on the way. If you are alone with the victim, make sure the victim is breathing and is not being further exposed to the poison before you call for emergency help. Apply artificial respiration if the victim is not breathing.

Read the first aid instructions on the pesticide label, if possible, and follow them. Do not become exposed to poisoning yourself while you are trying to help. Take the pesticide container (or the label) to the physician. Do not carry the pesticide container in the passenger space of a car or truck.

Poison on skin

- Act quickly.
- Remove contaminated clothing and drench skin with water.
- Cleanse skin and hair thoroughly with detergent and water.
- Dry victim and wrap in blanket.

Chemical burn on skin

- Wash with large quantities of running water.
- Remove contaminated clothing.
- Cover burned area immediately with loose, clean, soft cloth.
- Do not apply ointments, greases, powders, or other drugs in first aid treatment of burns.

Poison in eye

- Wash eye quickly but gently.

Table C.6 Protective Clothing and Equipment Guide

	LABEL SIGNAL WORD		
Formulation	**CAUTION**	**WARNING**	**DANGER**
Dry	Long-legged trousers and long -sleeved shirt; shoes and socks.	Long-legged trousers and long-sleeved shirt; shoes and socks; wide-brimmed hat; gloves.	Long-legged trousers and long-sleeved shirt; shoes and socks; wide-brimmed hat; gloves; cartridge or canister respirator if dusts in air or if label precautionary statement says: "Poisonous or fatal if inhaled..
Liquid	Long-legged trousers and long-sleeved shirt; shoes and socks; wide-brimmed hat.	Long-legged trousers and long-sleeved shirt; shoes and socks; wide-brimmed hat; rubber gloves. Goggles if required by label precautionary statement. Cartridge or canister respirator if label precautionary statement says: "Do not breathe vapors or spray mists." or "Poisonous if inhaled."	Long-legged trousers and long-sleeved shirt; rubber boots, wide-brimmed hat; rubber gloves, goggles or face shield. Canister respirator if label precautionary statement says: "Do not breathe vapors or spray mists," or "Poisonous if inhaled."
Liquid (when mixing)	Long-legged trousers; long-sleeved shirt; shoes and socks; wide-brimmed hat; gloves; rubber apron.	Long-legged trousers and long-sleeved shirt; shoes and socks; wide-brimmed hat; rubber gloves; goggles; or face shield; rubber apron. Respirator if label precautionary statement says: "Do not breathe vapors or spray mist," or "Poisonous (or fatal or harmful) if inhaled."	Long-legged trousers and long-sleeved shirt, rubber boots, wide-brimmed hat, rubber gloves, goggles or face shield. Canister respirator if label precautionary statement says: "Do not breathe vapors or spray mists," or "Poisonous if inhaled."
Liquid (when mixing)	Long-legged trousers; long-sleeved shirt; boots, rubber gloves, water-proof wide-brimmed hat.	Water repellent, long-legged trousers and long-sleeved shirt, rubber boots; rubber gloves; rubber apron, water-proof wide-brimmed hat, face shield, cartridge or canister respirator.	Water-proof suit, rubber gloves, water-proof hood or wide-brimmed hat.

- Hold eyelid open and wash with gentle stream of clean running water.
- Wash for 15 minutes or more.
- Do not use chemicals or drugs in the wash water. They may increase the extent of injury.

Inhaled poison

- Carry victim to fresh air immediately.
- Open all doors and windows so no one else will be poisoned.
- Loosen tight clothing.
- Apply artificial respiration if breathing has stopped or if the victim's skin is blue. If patient is in an enclosed area, do not enter without proper protective clothing and equipment. If proper protection is not available, call for emergency equipment from your fire department.

Poison in mouth or swallowed

- Rinse mouth with plenty of water.
- Give victim large amounts (up to 1 quart) of milk or water to drink.
- Induce vomiting only if instructions to do so are on the label.

Procedure for inducing vomiting

- Position victim face down or kneeling forward, Do not allow victim to lie on his back, because the vomitus could enter the lungs and do additional damage.
- Put finger or the blunt end of a spoon at the back of victim's throat or give syrup of ipecac.
- Collect some of the vomitus for the physician if you do not know what the poison is.
- Do not use salt solutions to induce vomiting.

When not to induce vomiting

- If the victim is unconscious or is having convulsions.
- If the victim has swallowed a corrosive poison. A corrosive poison is a strong acid or alkali. It will burn the throat and mouth as severely coming up as it did going down. It may get into the lungs and burn there also.
- If the victim has swallowed an emulsifiable concentrate or oil solution. Emulsifiable concentrates and oil solutions may cause severe damage to the lungs if inhaled during vomiting.

Table C.7 Types of Toxicity

Type	#of Exposures	Time for Symptoms to Develop
Acute	Usually 1	Immediate (Minutes to hours)
Subchronic	A few	2 days to 1 week
Chronic	More than a few	1 week to years
Delayed	1 or more	Long after exposure (often years later)

The toxicity categories, along with some common symptoms of related pesticide poisoning, are shown in Table C.8. Additional categories of pesticide poisoning specific to the organophosphate group of pesticides are shown in Table C.9.

Table C.8 Toxicity Categories with Common Symptoms

Category	System Affected	Common Symptoms
Respiratory	Nose, trachea, lungs	Irritation, coughing, choking, tight chest
Gastrointestinal	Stomach, intestines	Nausea, vomiting, diarrhea
Renal	Kidney	Back pain, urinating more or less than usual, discolored urine
Neurological	Brain, spinal cord, behavior	Headache, dizziness, confusion, depression, coma, convulsions
Hematological	Blood	Anemia (tiredness, weakness)
Dermatological	Skin, eyes	Rashes, itching, redness, swelling (cutaneous)
Reproductive	Ovary, testes, fetus	Infertility, miscarriage, birth defects

Table C.9 Symptoms of Acute Organophosphate Poisoning

Mild Poisoning	Moderate Poisoning	Severe Poisoning
Fatigue	Inability to walk	Unconsciousness
Headache	Weakness tion of pupil	Severe constric-
Dizziness	Chest discomfort	Muscle twitching
Blurred Vision	Constriction of pupil	Secretions from mouth, eyes and nose
Too much sweating and salivation	Earlier symptoms are more severe	Breathing difficulty
Nausea and vomiting		Coma and death

Table C.10 USEPA Labeling Toxicity Categories by Hazard Indicator

Toxicity Categories	Hazard Indicator: Signal word	Oral LD_{50}	Inhalation LD_{50}*	Dermal LD_{50}	Eye Effects**	Skin Effects
I	DANGER-POISON	Up to and incl. 50 mg./liter	Up to and incl. 0.2 mg./liter	Up to and incl. 200 mg./liter	Corrosive; corneal opacity not reversible within 7 days	Corrosive
II	WARNING	From 50 through 500 mg./liter	From 0.2 through 2 mg./liter	From 200 through 2,000 mg./liter	Corneal opacity reversible within 7 days; persisting for 7 days	Severe irritation at 72 hours
III	CAUTION	From 500 through 5,000 mg./kg.	From 2 through 20 mg./liter	From 200 through 2,000 mg./kg	No corneal opacity; irritation reversible within 7 days	Moderate irritation at 72 hours
IV	CAUTION	Greater than 5,000 mg./kg	Greater than 20 mg./1	Greater than 20,000 mg./kg	No irritation	Mild or slight rritation at 72 hours

* Based on 1-hour exposure: divide by four to reflect 4-hour exposure.

** The duration of the eye observation period now routinely extends to 21 days.

Table C.11 WHO Classification System According to Acute Toxicity

Class	Hazard Level	Oral Toxicity* Solids**	Oral Toxicity* Liquids**	Dermal Toxicity* Solids**	Dermal Toxicity* Liquids**
Ia	**Extremely Hazardous**	5 or less	20 or less	10 or less	40 or less
Ib	**Highly Hazardous**	5 - 50	20 - 200	10 - 100	40 - 400
II	**Moderately Hazardous**	50 - 500	200 - 2000	100 - 1000	400 - 4000
III	**Slightly Hazardous**	over 500	over 2000	over 1000	over 4000

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* Based on LD_{50} for the rat (mg/kg body weight)

** The terms “solids” and “liquids” refer to the physical state of the product or formulation being classified.

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It will also help in guiding project management to ensure that pesticides are not used inappropriately. Since pesticide use is mainly an issue with agricultural projects involving trees or food production, livestock projects, and health projects (control of mosquitos, schistosomiasis pathogens, tsetse fly, etc.), particular care should be taken with those sectors. The same caution should be used anytime pesticides are employed as part of project activities in any sector.

1. Check off all ways in which pesticides will be used.

	By Project Staff	By Project Recipient	Others (Specify)
Demonstration	_____	_____	_____
Research	_____	_____	_____
Training	_____	_____	_____
Vector Control	_____	_____	_____
Others (list)	_____	_____	_____

2. Check the technical expertise of the people to be handling pesticides:

	Staff	Project Recipients	Others (specify)
Well-trained	_____	_____	_____
Moderately trained	_____	_____	_____
Not trained	_____	_____	_____
Others (explain)	_____	_____	_____

3. Pesticides are needed to manage pests on (check one or more):

_____ Crops
_____ Livestock
_____ Others; please specify:_____

4. Can your staff identify the main pest organisms?

_____Yes _____No

5. Do you know which pesticides are needed?

_____Yes _____No

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6. List pesticides needed, indicating each commodity (crop type, livestock type, tree, etc.) and specify pests (name of specific insects, diseases, weeds, storage pests, etc.) needing control, using the format shown below.

Commodity	Pest	Pesticide Common Name	Trade Name

7. Pesticide Storage Facilities

a) Do you have a storage facility on the project site designated solely for pesticides?

_____Yes, describe:
_____No

b) Is the storage shed well lit, ventilated, and safe from flooding?

_____Yes _____No

c) Are pesticides kept away from food, feed, or water?

_____Yes _____No

d) Are storage facilities secure and kept locked when not in use?

_____Yes _____No

e) Are all pesticides kept in their original, labeled containers?

_____Yes _____No

f) Are warning signs posted outside the storage sheds?

_____Yes _____No

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g) Are pesticides stored away from flammable/combustible materials?

_____Yes _____No

h) Is there a well-established procedure to clean up spills?

_____Yes, namely:
_____No

8. Safe Use of Pesticides

a) Do you have a place to mix the pesticides safely?

_____Yes, describe:
_____No

b) Do you have protective clothing (e.g. rubber boots, coveralls, gloves, masks, eye protection)?

_____Yes, describe:
_____No

c) Do you have measuring and mixing equipment?

_____Yes, describe:
_____No

d) Do you have a supervisor in the project designated to oversee all pesticide operations?

_____Yes, who?:_____;
Level of training? _____
_____No

e) Is your staff familiar with appropriate pesticide disposal procedures?

_____Yes _____No

f) Describe how you plan to dispose of pesticide containers:

metal? _____
glass? _____
plastic? _____
paper? _____
cardboard? _____

g) Isyour staff familiar with first-aid procedures for pesticide poisoning?

_____Yes _____No

h) Are emergency procedures in place in case of accidental poisonings?

_____Yes: Briefly describe_____
_____
_____No

i) Are there procedures for observing restricted entry intervals after applications?

_____Yes _____No

9. Application Equipment

a) Describe equipment you will be using to apply the pesticide.

b) Is there a trained person on the project whose job will be to maintain application equipment, including nozzles and sieves?

_____Yes _____No

c) Are spare parts available in local stores?

_____Yes _____No

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10. General Pest Management Concerns

a) Have you identified pesticide-related risks in your project area and analyzed whether pesticide use is justified, affordable, and can be adequately managed and supervised?

_____Yes _____No
_____N/A

b) Will your staff be training other people in pest management and pesticide use?

_____Yes, whom?
_____No

c) Are funds available for necessary materials, training methods, and follow-up included in your project paper?

_____Yes, estimated costs? _____
_____No

11. IPM approach

a) Is the project promoting the adoption of preventive, nonchemical management measures?

_____Yes _____No

If yes, indicate which (crop rotation, biocontrol, use of resistant cultivars, crop diversification, tillage, sanitation, manual weed destruction, etc):_____
_____

b) Are pesticides being applied only as last-resort measures and based on action threshold criteria? Are there pest monitoring procedures being used to determine the need for pesticide treatments?

_____Yes _____No

c) Can farmers and project extensionists readily distinguish pest from nonpest organisms? Can they recognize common beneficial species (pollinators, predators, and parasitoids)?

_____Yes _____No

Pesticide Use Checklist for PVOs and NGOS (Page 6)

12. Environmental Impact

a) Are there wildlife sanctuaries, preserves, or any other protected habitats in or near the project implementation area that might be affected by pesticide use?

_____Yes, namely:
_____No

b) Are there water bodies (lakes, lagoons, reservoirs, rivers, streams, estuaries, etc.) near the project areas that might be subject to pesticide contamination through drift, runoff, or spills?

_____Yes. Describe:
_____No

c) Are wildlife and domestic animals protected from poisoned baits?

_____Yes. How?
_____No

13. Pesticide monitoring

Is there a system in place for tracking pesticide use activities, including frequency of applications, techniques, chemicals used, doses, target pests, effectiveness, criteria for applying, and safe use practices?

_____Yes
_____No

14. Literature Needs

Have you included literature needs in your activity?

_____Yes
_____No

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15. Check off areas where additional assistance may be needed:

	Consultancy	Training
Pest identification	_____	_____
Pesticide selection	_____	_____
Handling pesticides (transport, mixing, loading, application, equipment clean up, disposal)	_____	_____
Application equipment	_____	_____
IPM	_____	_____
Pesticide storage	_____	_____
Protective clothing	_____	_____
Measuring and mixing equipment	_____	_____
Training (designate activity)	_____	_____
Literature	_____	_____
Training materials	_____	_____
Other (specify)	_____	_____

Conversion Factors

English To Metric

Multiply	By	To Get
Acres	0.405	Hectares
Feet	30.48	Centimeters
Feet	0.305	Meters
Inches	2.54	Centimeters
Ounces	28.35	Grams
Pints	0.473	Liters
Pounds	453.592	Grams
Quarts	0.946	Liters
Tons	907.185	Kilograms
Yards	.914	Meters
Pounds per Acre	1.1	Kilogram per Hectare
Pounds per Gall.	120.0	Grams per Liter

Metric To English

Multiply	By	To Get
Grams	0.035	Ounces (dry)
Hectares	2.47	Acres
Kilograms	2.205	Pounds
Kilometers	3281	Feet
Kilometers	0.621	Miles
Liters	0.264	Gallons
Liters	2.113	Pints
Liters	1.057	Quarts
Meters	3.281	Feet
Meters	39.37	Inches
Meters	1.094	Yards
Kilograms per Hectare	0.89	Pounds per Acre

English

Multiply	By	To Get
Acres	43.56	Square Feet
Acres	4.84	Square Yards
Cups	8	Ounces (fluid)
Cups	16	Tablespoons
Feet	12	Inches
Feet	0.333	Yards
Gallons	128	Ounces (fluid)
Gallons	8	Pints
Gallons	4	Quarts
Miles	5,280	Feet
Miles	1758	Yards
Miles per Hour	8	Feet per Minute
Miles per Hour	1.467	Feet per Second
Miles per Minute	88	Feet per Second
Miles per Minute	60	Miles per Hour
Ounces (dry)	0.063	Pounds
Ounces (fluid)	0.063	Pints
Ounces (fluid)	0.031	Quarts
Pints	0.125	Gallons
Pints	2	Cups
Pints	16	Ounces (fluid)
Pints	0.5	Ounces (fluid)
Pounds	16	Ounces (dry)
Quarts	2	Pints
Quarts	0.25	Gallons
Quarts	32	Ounces (fluid)
Quarts	2	Pints
Tablespoons	3	Teaspoons
Yards	3	Feet
Yards	36	Inches

Metric

Multiply	By	To Get
Grams	0.001	Kilograms
Grams	1,000	Milligrams
Kilograms	1,000	Grams
Meters	100	Centimeters
Meters	0.001	Kilometers
Meters	1,000	Millimeters

AppendixD

Steps to Implement Integrated Pest Management

Although specific pest management needs vary with the crop, cropping system, pest problems, pesticide use history, socioeconomic conditions, and other factors, there are well-defined principles that guide the implementation of IPM. Based on these principles, some guidelines can be offered for the development and execution of IPM activities in developing countries. NGOs/PVOs should adapt these guidelines to the conditions found in their projects' areas of influence.

IPM is a decision-making process for the selection, implementation, and evaluation of pest management practices. It utilizes all available methods to achieve the most economically and environmentally sound management program. IPM is the integration of available techniques to reduce pest populations and maintain them below the levels causing economic injury in a way that avoids harmful side effects.

IPM is not an alternative to the use of chemical pesticides; it is an integration of methods that can reduce use of pesticides by employing them more judiciously. IPM is a way of considering options available in light of the physical and biological environment. It requires working directly with farmers to replace extraneous use of pesticides with improved practice of crop management and decision-making based on weighing costs and benefits of alternatives to pesticide use.

IPM can decrease pest losses, lower pesticide use, and reduce overall operation costs, while increasing crop yield and stability. Successful IPM programs have been developed for pests on various crops.

The following steps represent the most essential elements in the development of an IPM program.

STEP 1: ASSESS IPM NEEDS AND ESTABLISH PRIORITIES

In planning IPM projects consider the relative importance of agriculture in the overall program. If agriculture is a major component, IPM and pesticide management issues should be addressed. Consider the relative importance of target crops regarding area, value, and importance as source of livelihood for beneficiary farmers. Consider, further, crop protection needs, farmers' perceptions of pest problems, pesticide use history and trends, availability of IPM technology, farming practices, access to sources of IPM expertise, support for IPM research and technical assistance, and training needs for farmers and project extensionists.

Identify strategies and mechanisms for fostering the transfer of IPM technology under various institutional arrangements, mechanisms, and funding levels. Define what is available for immediate transfer and what may require "quick and dirty" adaptation and validation research.

During the planning stages of an IPM program, the inputs from experienced IPM specialists will be extremely useful. If possible, set up an initial planning workshop to help define and orient implementation activities.

Respect and use local knowledge. Farmers could already be using one or more preventive measures. It is therefore important to talk to the farmers before determining what measures are needed. In planning and implementing an activity that involves crop protection, we should be committed to a participatory process that will include local environmental knowledge. In bringing people together to understand and

work on solutions to their problems, try to ensure that research and education tools are available that the people can use to understand and express their knowledge.

STEP 2: IDENTIFY KEY PESTS FOR EACH TARGET CROP

A pest is an organism that competes with or is injurious to humans or their crops, animals, and other possessions. Agricultural pests include species of arthropods (insects and mites), mollusks (snails and slugs), vertebrates (mainly rodents and birds), nematodes, plant pathogens (virus, bacteria, and fungi), and weeds. Numerous insects and arachnids transmit diseases to humans and domestic animals. Others cause annoyance, irritation, or injury through their feeding activities. An organism can achieve "pest" status under some conditions but not under others.

Become familiar with the key pests of target crops and the kind of damage that they cause. Although hundreds of species of organisms can be found in a crop at one time or another, only a few of them may cause substantial crop loss. Those species that recur at intolerable levels on a regular basis are known as key pests and are the main concern of IPM programs. These usually amount to a handful of species in any one crop and can include any combination of insects, pathogens, weeds, diseases, and vertebrates. A few other species, known as secondary or occasional pests, attain damaging status from time to time.

That the vast majority of insect species found in any one crop are nonpests, and many of these are actually predators and parasites of plant-feeding species (See Table 1). Many farmers are not aware of these distinctions and must be taught to correctly identify the more common pest and beneficial species found in their crops. Incorrect identification may lead to unnecessary pesticide applications.

This diagnostic phase requires sampling and careful observation. Usually, most key pests are fairly well known by local farmers and public sector extension personnel. However, a few species may be poorly known or understood because of their nocturnal or inconspicuous habits or small size. These include soil-inhabiting species such as nematodes and insect larvae (wireworms, white grubs, cutworms), mites, and pathogens (viruses, bacteria, mycoplasma, fungi). In addition, farmers usually do not understand the role of some insects as vectors of plant diseases.

STEP 3: MONITOR THE FIELDS REGULARLY

The growth of pest populations usually is related closely to the stage of crop growth and weather conditions, but it is difficult to predict the severity of pest problems in advance. The crops must be inspected regularly to determine the levels of pests and natural enemies and crop damage.

Farmers, survey personnel, and agricultural extension staff can assist with field inspections. They can train other farmers to separate pests from nonpests and natural enemies and to determine when crop protection measures, perhaps including pesticides, are necessary.

STEP 4: SELECT AN APPROPRIATE BLEND OF IPM TOOLS

An IPM program can draw from and integrate a variety of pest management techniques, as necessary. IPM does not require predetermined numbers or combinations of techniques, nor is the inclusion of any one technique required for IPM implementation. Thus, an IPM program can include a chemical control component. Most nonmigratory pests of traditional cropping systems in Africa are already under adequate cultural and natural (biological) control and introducing pesticides into such systems may not be economically or environmentally justifiable. In this case, the IPM strategy should be to maximize the effectiveness of traditional and introduced nonchemical control techniques, in the least ecologically disruptive manner.

Pesticides should be used only if no practical, effective, and economic nonchemical control methods are available. Once the pesticide has been carefully chosen, it should be applied only to keep the pest below the intervention threshold. When dealing with crops that are already being treated with pesticides, IPM should aim first at reducing the number of pesticide applications through the introduction of appropriate *action thresholds* (see Chemical Control section below), while promoting appropriate pesticide management practices (see Appendix C) and shifting to less toxic and more selective products and nonchemical control methods. In most cases, NGOs/PVOs will probably need to deal with low to moderate levels of pesticide use.

Either way, an IPM program should emphasize preventive measures and protect a crop while interfering as little as possible with the production process.

Examples of Nonchemical Pest Management Techniques

- Maintaining good soil fertility and a diverse agroecosystem
- Planting resistant crop varieties
- Selecting proper plant varieties for location and season
- Rotating crops
- Planting clean seed
- Correct planting and harvest periods
- Proper irrigation methods
- Correct fertilizer and rates
- Good crop sanitation
- Hand picking of larger pests
- Use of natural control agents (biological control)
- Using attractants and repellents on selected pests

IPM methods include: biological control, cultural control, physical and mechanical control, use of resistant plant varieties, behavioral control, selective chemical control, and autocidal control. Some the more relevant of these are discussed below.

Biological Control

Biological control or biocontrol is traditionally defined as the action of natural enemies (predators, parasitoids, and pathogens) that keeps the population density of an organism at lower levels than would occur without such action (De Bach 1974). Classical biological control is the suppression of an exotic pest species by *introduced* natural enemies. It is a specialized area that requires extensive research and which in the past has seldom required farmers participation, except during the final release stages. The most recent and dramatic example of a successful classical biocontrol program in Africa is the control of the South American cassava mealybug by the parasitic wasp *Epidinocarsis lopezi*, resulting in a reduction in losses of between 50 percent to 90 percent (NRI 1992).

In IPM, biocontrol primarily involves the encouragement or use of indigenous and introduced natural enemies to help reduce pest populations. Natural enemies are often the first line of defense against the unchecked population increase of key or potential insect pests. Their diversity and abundance in agroecosystems tend to be directly proportional to the diversity and stability of cropping system and inversely proportional to the intensity of pesticide use. By parasitizing and preying on plant-feeding species (as well as on one another), a diverse natural enemy complex exerts a damping effect on the population growth of any one species, thus contributing to keeping key and occasional pest populations in check, while inhibiting altogether the excessive population growth of potential pest species.

In the absence of pesticides, a complex of predators and parasitoids that include wasps, ants, beetles, neuropterans, flies, true bugs, and spiders contributes to regulate the abundance of insect pest populations in most crops. Among the more important of these are minute parasitic wasps in the superfamily

Chalcidoidea and family Braconidae, many of which are quite specific in their feeding habits. The importance of natural enemies is often overlooked by farmers and extensionists alike, and learning to identify them in the field and to recognize their actual role in the natural management of insect pests requires a special effort that needs to be addressed by NGOs/PVOs. Table 1 lists some of the more common natural enemies of insect pests.

Two biological control strategies are recognized in IPM: *conservation and augmentation* of natural enemies. The first is comparable to wildlife management and involves the manipulation of a pest's environment to make it more suitable for natural enemies. Examples of conservation measures include: decreased pesticide use and shifting from broad-spectrum insecticides to more selective ones; encouragement and protection of diversified cropping systems; changes in cultivation and harvesting practices to protect as much as possible natural enemies; controlling honeydew-feeding ants when these interfere with natural enemy activities; protecting and encouraging crops, native vegetation, and "weeds" known to be a source of nectar, pollen, and shelter for natural enemies (but excluding known hosts of crop pests). The conservation of natural enemies should be given a high priority in any IPM program.

Augmentation refers to the production and release of natural enemies. Natural enemies can be reared and released in large numbers (inundative releases) to directly effect mortality on target pests. *Trichogramma* spp. wasps are used in this fashion. Alternatively, small numbers of a natural enemy may be strategically liberated (inoculative releases) to reintroduce it into areas from that it has been eliminated or to help build up its populations in advance of an anticipated pest outbreak. The augmentation of natural enemies should be undertaken only when there is clear evidence of the effectiveness of a natural enemy, when so used, against a major pest of an important crop. The rearing and release techniques must be fully worked out and be ready for transfer to small farmers.

There are several examples of small-scale farmers implementing natural enemy production operations. In Central America, a parasitic wasp is being reared by farmer associations for release against the coffee berry borer, *Hypothenemus hampei*. In Peru, a CARE IPM project is supporting the production of a baculovirus that controls the potato tuber moths, *Phthorimaea operculella* and *Symmetrischema plaesiosema*, and of the fungus *Beauveria brongniartii* for the control of the Andean weevil, *Premnotrypes* spp.

Commercial formulations of microbial control agents (insect-specific protozoans, helminths, viruses, bacteria, and fungi) can be suitable alternatives to synthetic insecticides. For instance, formulations of various strains of *Bacillus thuringiensis* are available for the control of some caterpillars, the Colorado potato beetle, and mosquito and black fly larvae. The fungi *Metarhizium flavoviride*, *M. anisopliae*, and *Beauveria bassiana* have been tested with success against several grasshopper species and could have a potential role in future preventive control strategies for African migratory locusts (Showler 1995). The use of microbial insecticides requires precise handling and application techniques, and their effectiveness can be affected by climatic and environmental conditions. For example, *Nosema locustae*, a protozoan that has been tested in the United States for its locust control potential, has a short shelf life and must be used soon after production.

Table D.1 Common Predaceous and Parasitic Anthropods

Order	Family	Common name
Orthoptera	Mantidae	Preying mantis
Hemiptera	Nabidae	Damsel bugs
(true bugs)	Anthocoridae	Pirate bug
	Reduviidae	Assassin bug
Neuroptera	Chrysopidae	Green lacewing
	Hemerobiidae	Brown lacewing
Coleoptera	Carabidae	Ground beetles
(beetles)	Coccinellidae	Lady beetles
	Staphylinidae	Rove beetles
Diptera	Asilidae	Robber fly
(flies)	Tachinidae	Tachinid flies
	Syrphidae	Hover flies
Hymenoptera	Vespidae	Social wasps
(wasps, ants	Sphecidae	Thread-waisted wasps
bees)		and others
	Scoliidae	Scoliid wasps
	Formicidae	Ants
	Tiphiidae	Tiphiid wasps
	Ichneumonidae	Ichneumonid wasps
	Braconide	Braconid wasps
	Superfamily Proctotrupoidea (parasitic wasps)	
	Diapriidae	
	Scelionidae	
	Platygasteride	
	Superfamily Chalcidoidea (parasitic wasps)	
	Aphelinidae	
	Eulophidae	
	Mymaridae	
	Eupelmidae	
	Encyrtidae	
	Chalcididae	
	Pteromalidae	
Araneae	Salticidae	Jumping spiders
(spiders)	Clubionidae	Sac spiders
	Gnaphosidae	Gnaphosids
	Lycosidae	Wolf spiders
	Oxyopidae	Lynx spiders
	Thomisidae	Crab spiders
	Theredíidae	Combfooted spiders
	Araneidae	Orb-weavers
	Linyphiidae	Sheetweb weavers
	Agelenidae	Funnel weavers
Acarina	Phytoseiidae	Predatory mites

Cultural Control

Cultural controls are modifications of agronomic practices to make the environment less favorable for the survival, growth, or reproduction of pests, thus exploiting weak links in their behavior or life cycle. Cultural practices include crop rotation, intercropping, increasing crop diversity, sanitation, hand removal of large pests; strategic timing of tillage, planting, irrigation, fertilization, and harvesting; destruction of alternate pest hosts; use of mulches, barriers, and trap crops; use of pest-free planting stock and seed.

Many cultural measures are applied by small farmers in Africa as part of crop production practices. If careful conservation confirms their effectiveness, indigenous cultural practices should be incorporated into IPM programs. If necessary, test, validate, and adapt promising practices shown to be effective elsewhere.

The timing of planting and harvesting can be altered to avoid both early and late season pests. For instance, early planting of maize in Ethiopia allows this crop to escape stalk borer infestations. Tillage can be used to control weeds and expose soil pests to predators. Care should be taken, however, to prevent the soil from being exposed to wind and water erosion for extended periods. Cover crops can be planted to prevent weed growth while providing food and shelter to natural enemies.

Destruction of crop residues after harvest, by plowing-under or burning, helps reduce pest populations in infested material and prevents their potential carryover to the next crop. Crop rotation is recommended when successive crops are attacked by the same or related pest species having limited dispersal capacity, being especially effective against soil-borne nematodes and pathogens. Simple techniques such as using protected courtyards for tree seedling nurseries or covering seedlings with mosquito netting can be effective in small-scale operations.

Chemical Control

Appendix C is devoted entirely to pesticide managements, only some key elements of chemical control will be discussed here. Under IPM, pesticides are applied only when absolutely needed, i.e., on the basis of economic or action threshold criteria. In addition, applications are made as selectively as possible regarding timing and location to aim these only at target pests. Human safety considerations are also central to the planning of pesticide applications.

Action Thresholds: The criterion used to determine whether taking action to manage a pest organism is economically and environmentally justifiable is known as the action or economic threshold. This is the break-even point at which management costs should equal crop returns. The action threshold (AT) is also defined as the pest population density or level of crop damage at which action must be taken (commonly, a pesticide application) to prevent it from reaching the *economic injury level* (EIL).

The EIL is defined as the lowest population density at which a given pest will cause economic damage to a crop if no action is taken. The EIL and AT concepts are central to IPM implementation when natural control and preventive measures fail to keep a pest organism from approaching abundance levels that can result in economic crop loss (Pedigo et al. 1986, Pedigo and Higley 1992).

Factors influencing the AT for a given pest include: plant variety and stage of development, crop market value, presence of natural enemies, cost of control measures, and external costs to health and the environment. The AT depends on the relationship between pest density and potential yield loss and on the cost-effectiveness of the pest control measure. AT values will change as these variables change.

An AT developed in one region may not be suitable for use in another, but it can be useful as the basis for designing one that is. Without access to ATs or similar criteria, any IPM extensionist would be hard pressed when trying to help farmers to decide whether to apply a pesticide. Some sort of AT for key pests, based on simple pest counts or damage indicators, is

always essential. As a stop-gap measure, it may be necessary to adopt action thresholds developed for the same or similar pests of same or similar crops grown in other regions, until better systems are developed. Validation and adaptation to local conditions is essential and should be done if personnel and resources are available.

The EIL and AT indicate quantitative relationships existing between pest population density and crop damage. The AT may be expressed in various ways depending upon the crop and the pest. Examples of AT indicators based on insect pest population estimates include: numbers of insects per leaf, fruit, tuber, plant, section crop row, or unit area; number of insects caught in an x number of net sweeps; number of insect caught per unit time in traps of various kinds (sticky, color, water, light, pitfall, chemical attractants, pheromones, etc.), percentage of plant structures (leaves, buds, flowers, fruits, seeds) damaged by a pest; average numbers of weeds per square meter; and number of pests per unit volume of soil or water (Southwood 1978).

It is essential to demonstrate to farmers that crop injury does not necessarily equate economic crop loss. To a greater or lesser extent, most plants compensate for foliage, fruit, or other parts damaged by pests by growing additional structures. Often, some products partially damaged by pests may still be used for food or feed and are not a total loss. On the other hand, because of stringent quality requirements imposed by the market on certain high-value crops, even superficial injuries, such as deformations, scars and blemishes, may cause economic losses.

In most cases it is possible to find some information that can be adapted to local AT needs, and it is seldom necessary to start from zero. However, if no such information exists, a crude AT can be generated by observing and estimating pest density-yield loss relationships under field conditions. If time and resources permit, field trials should be conducted to correlate various pest density levels and resulting yield losses.

The idea is to come up with tangible, practical indicators that farmers can easily use as a guide when trying to decide if they should or should not apply a pesticide to control a particular pest. At this point, the assistance of an experienced IPM specialist should be sought to help set up field tests. Afterwards, the AT can gradually be refined and modified through time, as feedback from farmers and measurable results become available.

Pest Monitoring and Survey: When selective pesticide applications are required, it is essential to monitor pests regularly. The growth of pest populations is affected by natural enemies, alternate plant hosts, farming practices, stage of crop growth, weather conditions, and other factors, making it difficult to predict the severity of pest problems in advance. Crops must be inspected regularly to determine crop damage levels and the abundance of pests and their natural enemies. Pests should be monitored on a regular basis throughout the growing season.

Pest monitoring requires some knowledge of pest biology, crop-pest interactions, pest distribution in time and space, and ecological factors that influence their abundance. Although farmers should ultimately be responsible for field inspections, extensionists should provide guidance and train farmers to distinguish pest from non-pest species, to recognize insect pests' natural enemies, and to determine when crop protection measures are necessary.

Behavioral control

Among the various behavior-modifying chemicals known, only the pheromones play a substantial role in IPM. A pheromone is a substance that is secreted by one animal and affects the behavior of another animal of the same species. Pheromones are species-specific and may mediate various kinds of behavior, such as mating, aggregation, dispersal, recognition, aggression, and defense.

Among these, the sex pheromones have proven useful for IPM in agricultural systems, their greatest value being as lures in traps used for monitoring the presence, activity, and abundance of many insect pests (McNeil 1991). Pheromone traps can be useful to monitor the presence and movements of highly mobile insect species, as it is being done with the

African armyworm, *Spodoptera exempta*, in East Africa, with *Heliothis armigera* in Asia, the pink bollworm, *Pectinophora gossypiella*, in western U.S. states, and other species worldwide.

The usefulness of pheromone traps as reliable indicators of pest abundance on which to base action thresholds remains rather limited. Trap capture rates reflect not only pest population densities but also ambient temperature, relative humidity, wind speed; insect age and physiological state; trap design, location, and density, and other factors. In addition, the high cost and maintenance requirements of pheromone traps tend to discourage their adoption by small farmers in developing countries.

Sex pheromones have also been used to disrupt the mating activities of some pest moths, thus reducing the abundance levels of their progeny (the damaging larval stage). In this technique, commercially available sex pheromones (which in most species is emitted by the female and acts as a lure for males seeking mates) are released at levels that interfere with the natural pheromone-mediated mate location system. As most mating is prevented, few female moths are fertilized, most will lay unfertilized eggs, and the next generation is drastically reduced. This technique is expensive and has been used successfully with few pest species.

Occasionally, pheromone traps have also been used as tools for directly reducing pest populations through mass capture. For instance, under International Potato Center guidance, farmers in Cuba and the Dominican Republic are controlling the sweet potato weevil, *Cylas formicarius*, to the extent that insecticide applications are no longer necessary. The technique uses plastic containers filled with water, baited with the weevil's aggregation pheromone, and placed at set intervals in sweet potato fields. Weevils of both sexes are attracted in large numbers to the traps, where they drown.

Pheromone traps are also used effectively to monitor and manage pests of stored grain in warehouses. Other behavior-modifying chemicals that are used with some success in IPM include feeding deterrents and repellents of various kinds.

STEP 5: DEVELOP EDUCATION, TRAINING, AND DEMONSTRATION PROGRAMS FOR EXTENSION WORKERS.

Implementation of IPM depends heavily on education, training, and demonstration to help farmers and extension workers develop and evaluate the IPM methods. Hands-on training conducted in farmers' fields (as opposed to a classroom) is a must. See the Agricultural Pest Management section of the present Environmental Guidelines for a discussion of the participatory "Farmers' Field School" approach. Special training for extension workers and educational programs for government officials and the public are also important.

AppendixE-1

USAID Environmental Procedures

Automated Directive System[1]

204 ENVIRONMENTAL PROCEDURES

This chapter provides policy and essential procedures about how to apply 22 CFR 216 to the new USAID assistance process in order to ensure that assessments of the environmental consequences of all programs, activities, and substantive amendments thereto, are in full accordance with the requirements of Title 22 of the Code of Federal Regulations, Part 216.

204.1 Authority

1. Section 117 of the Foreign Assistance Act of 1961, as amended.
2. National Environmental Policy Act, 42 USC 4371, et seq.
3. Executive Order 12114 dated January 4, 1979, regarding environmental review of Federal agency actions outside the United States.
4. Title 22 of the Code of Federal Regulations, Part 216 dated October 9, 1980, codifies USAID's environmental procedures (cited as 22 CFR 216).

204.2 Objective

Environmental sustainability is integral to USAID's overall goal. To meet this goal environmental considerations shall be incorporated into results planning, achieving, and monitoring. This chapter defines what USAID and its operating units will do to integrate environmental issues into its programs to meet U.S. government environmental requirements.

204.3 Responsibility

1. Operational Bureaus

Operational Bureaus are responsible for overseeing and supporting their Operating Units to ensure that environmental review in accordance with 22 CFR 216 is fully integrated into the decision-making process, including planning and approval of all programs and activities needed to implement the Bureau and its Operating Units' Strategic Plan.

2. Operating Units

Operating Units are responsible for allocating adequate staff and financial resources to their Teams to effectively implement the Agency's environmental procedures. Operating Units also hold their Strategic Objective Teams accountable for meeting these requirements and continuously monitoring their results.

3. Strategic Objective, Strategic Support Objective, or Special Objective Teams (SO Teams)

Strategic objective (SO) teams are responsible for ensuring full compliance with 22 CFR 216, the Agency's environmental procedures. This includes

[1] The Automated Directives System (ADS) is a new series of USAID Operations Directives, comprising five series, of which the 200 series covers guidance on USAID Program Assistance, with four chapters, 201 - 204. Chapter 204 is to be used in conjunction with USAID's environmental regulations, 22 CFR Part 216, provided in Appendix E-2. ADS 204 was approved and promulgated as of March 1, 1996.

designing, monitoring, and modifying all programs, results packages, and activities to ensure that the environmental consequences of all actions taken by USAID are considered and that appropriate environmental safeguards are adopted. The SO Team is also responsible for keeping their relevant Bureau Environmental Officer informed on upcoming 22 CFR 216 actions through informal contacts and the R4; and for ensuring that all of its 22 CFR 216 environmental reviews are accomplished in a timely fashion so as not to unnecessarily delay implementation of any activities.

4. Mission Environmental Officer and Regional Environmental Officer (MEO and REO)

MEOs and REOs are responsible for advising SO Teams on how best to comply with 22 CFR 216 requirements, how SO Teams can effectively monitor implementation of approved mitigative measures, and how SO Teams can obtain additional environmental expertise to assist them. MEOs and REOs also liaise with their relevant Bureau Environmental Officers on 22 CFR 216 issues affecting SO Teams in their Operating Units.

5. Bureau Environmental Officer (BEO)

BEOs are responsible for overseeing the effective implementation of 22 CFR 216 throughout all Operating Units in their Bureau through timely decision making and adherence to consistent and strong environmental principles that lead to environmentally sound development.

6. Agency Environmental Coordinator (AEC)

The AEC is responsible for overseeing the effective implementation of 22 CFR 216 throughout the Agency. This includes monitoring its implementation, resolving disputes, advising in selection of BEOs, and liaising with the President's Council on Environmental Quality and the public.

204.4 Definitions (also see ADS glossary)

Definitions of environmental terms specific to this chapter are included throughout the text of 22 CFR 216.

Definitions of the following terms are found in the ADS Glossary:

Activity

Essential Procedure

Operating Unit

Results Package

Results Review and Resources Request (R4)

Special Objective

Strategic Objective

Strategic Objective Team

Strategic Plan

Strategic Support Objective

Acronyms used in this chapter are:

22 CFR 216 - Title 22 of the Code of Federal Regulations,

Part 216. These are USAID's environmental procedures and are sometimes referred to colloquially as Reg 16.

AEC - Agency Environmental Coordinator

BEO - Bureau Environmental Officer

EA - Environmental Assessment

EIS - Environmental Impact Statement

IEE - Initial Environmental Examination

MEO - Mission Environmental Officer

REO - Regional Environmental Officer

SO - Strategic Objective/Strategic Support Objective/Special Objective

SO Team - The team managing an SO. See the ADS glossary for further detail.

204.5 Policy

The following are the official Agency policies and corresponding essential procedures:

204.5.1 Mandatory Compliance with 22 CFR 218

The environmental procedures are codified in a Federal regulation. USAID must and shall fully comply with 22 CFR 216, except to the extent some of its terms are not used in the new operations assistance processes (i.e. PID, PP, etc.). In those cases the terms used in this chapter of the ADS (which are intended to be as parallel as possible to the original terms) are used instead. However, 22 CFR 216 is controlling in the event of a conflict between this chapter and

22 CFR 216. If there are questions, consult your BEO, the AEC, or Agency legal counsel. (see 22 CFR 216)

204.5.2 Operational Bureaus

Incorporated into their normal Results Review and Resources Request (R4) process each operational Bureau shall review and approve, with the guidance of their Bureau Environmental Officer, the R4 environmental section described below in 204.5.3

Bureaus shall provide each Operating Unit the resources necessary to complete environmental reviews for programs and activities in the Strategic Plan or any modification of it.

E204.5.2 Operational Bureaus N/A

204.5.3 Operating Unit

Each USAID Operating Unit shall prepare and submit an environmental section as an integral part of their R4. This section will consist of two parts:

- the first part will include a discussion of any issues that the Operating Unit may wish to raise with respect to implementation of mitigation measures, monitoring provisions or other implementation requirements agreed to pursuant to 22 CFR 216 during activity design; and,
- the second part will be an illustrative schedule of upcoming activities that may require 22 CFR 216 review. While this schedule will necessarily be notional due to the desired flexibility in allowing teams to revise and develop new activities, it will allow the BEO to better plan for work loads in order to have shorter turn around times on reviews and approvals of 22 CFR 216 documents. The schedule will also serve the operating unit as a planning document for budgeting its time and money resources to ensure that all 22 CFR 216 requirements are met in a timely way and will not become an impediment to speedy action.

Operating Units shall take necessary steps to ensure that each SO Team integrates timely and effective environmental review in the decision-making process for programs and activities and that sufficient money and staff are allocated to the SO Teams to accomplish the work.

Operating Units shall also take necessary steps to ensure that no irreversible commitments of resources for programs or activities are made by any of its Teams before environmental review is completed and its findings considered for the program or activity.

Operating Units shall undertake the required environmental planning analyses for its strategic plan as outlined in chapter 201.5.10g.

E204.5.3 Operating Unit N/A

204.5.4 Strategic Objective, Strategic Support Objective and Special Objective Teams (SO Teams)

Each SO Team shall actively plan how it will comply with 22 CFR 216 requirements for each activity it undertakes, actively monitor ongoing activities for compliance with approved IEE, EA, or EIS recommendations or mitigative measures; and modify or

end activities that are not in compliance. When an SO Team chooses to create Results Package (RP) Teams, it may delegate the implementation of these responsibilities to them. In these cases the SO Team is responsible for ensuring that the RP Teams have adequate time, staff, authority, and money to implement these responsibilities.

E204.5.4 Strategic Objective, Strategic Support Objective and Special Objective Teams (SO Teams): Operating Unit and SO Team Procedures

Each Operating Unit and SO Team shall develop effective essential procedures to:

- ensure that adequate time and resources are available to complete all environmental work required under 22 CFR 216 before funds are obligated (this environmental work includes IEEs, Categorical Exclusions, requests for deferrals or exemptions of environmental reviews and if appropriate, Scoping Statements and their related EAs or EISs). More specifically these environmental reviews include:
  - completing an IEE or justification for a Categorical Exclusion or Exemption, in accordance 22 CFR 216, for each program or activity at the earliest time in the planning and design process when sufficient information is known about the program or activity to permit a meaningful environmental threshold determination; it is essential that this review be done as early as possible in the design process in order to allow adequate time for more detailed subsequent environmental review and concurrence, as well as integrating environmental mitigations into the design process, should this be required;
  - completing Scoping Statements and EAs or EISs (if required) at the earliest time in the design process when sufficient information is known or being developed to undertake these analyses;
  - forwarding each environmental document to the BEO for review and concurrence, allowing a reasonable amount of time for this process;
  - providing reasonable notification to the affected public and, as feasible, encouraging public participation, review and comment on Scoping Statements and their related EAs or EISs. Public is defined for EAs to include directly affected people in the host country, host country governments. It is USAID's policy that interested U.S. parties should also be involved when they show an interest. For EISs including the U.S. public is a regulatory requirement;
  - considering the content and findings of environmental documents in the design and approval of each program and activity before an irreversible commitment of resources is made for the program or activity; and
  - incorporating environmental features andmitigative measures identified in IEEs, EAs, and EISs, as appropriate, in the final design and implementation of programs or activities.
- actively monitor and evaluate whether the environmental features designed for the activity resulting from the 22 CFR 216 process are being implemented effectively and whether there are new or unforeseen environmental consequences arising during implementation that were not identified and reviewed in accordance with 22 CFR 216. Based on the above described monitoring and evaluation initiate, modify or end activities as appropriate.
- provide the Operating Unit with any issues on environmental compliance and a schedule for any activities which must be reviewed under 22 CFR 216 to facilitate advance planning and provide information for the environment section of the R4.

204.5.5 Mission Environmental Officer (MEO) and Regional Envrionmental Officer (REO)

Each Mission Director shall appoint a Mission Environmental Officer. These officers normally serve as a core member of each SO Team in the Operating Unit in order to advise the Teams on specific needs and approaches to meet 22 CFR 216 requirements. The MEOs frequently take the lead in overseeing 22 CFR 216 document preparation on new activities and monitoring compliance on ongoing activities. However, the ultimate responsibility and accountability for successfully meeting 22 CFR 216 requirements belongs to every member on the Team and in particular to the team leader.

In some cases a regional support mission may exist and have a Regional Environmental Officer who is available to the cluster of Operating Units it supports. In these cases the Regional Environmental Officer provides technical support and regional coordination to Mission Environmental Officers.

E204.5.5 Mission Environmental Officer (MEO) and Regional Envrionmental Officer (REO) N/A

204.5.6 Bureau Environmental Officer (BEO)

After consultation with the AEC, the Assistant Administrator (AA) for each operational Bureau in Washington shall appoint a qualified BEO based in Washington. This includes all regional Bureaus plusall operational Central Bureaus (i.e. G and BHR). The BEO reviews and provides guidance on the environmental section of the R4; monitors overall 22 CFR 216 compliance of all Operating Units in the Bureau; approves all 22 CFR 216 documents, and performs the other specific functions described in 22 CFR 216. When staffing patterns permit, each AA shall also appoint a qualified Deputy BEO who can act on official 22 CFR 216 actions when the BEO is absent.

E204.5.6 Bureau Environmental Officer (BEO) N/A

204.5.7 Agency Environmental Coordinator (AEC)

The AEC shall oversee Agency-wide implementation of 22 CFR 216 to support the process in achieving its intended results. The AEC shall advise the Administrator, AAs, and other senior Agency management about issues that arise under 22 CFR 216, and with advice from the Office of the General Counsel, interprets how 22 CFR 216 should be applied to new or unusual situations. Specific additional responsibilities are described in 22 CFR 216.

E204.5.7 Agency Environmental Coordinator (AEC) N/A

204.5.8 Decision Making Authority

Within the operating unit the officer who has the authority to obligate funds for a program or activity signs the request for IEE, Categorical Exclusion or Exemption of the program or activity; and, if appropriate the Scoping Statement and EA or EIS (note: all of these 22 CFR 216 terms are defined in within 22 CFR 216). This officer submits these documents to the BEO for review and written concurrence. In certain cases outlined in 22 CFR 216 additional reviews and approvals in Washington may be required (e.g. requests for Exemptions, Deferrals, and EISs). After receiving the BEO's written concurrence the Operating Unit's decision-making officer must consider the environmental findings and recommendations made in the approved IEE, EA, or EIS when designing and approving funding for a program or activity. Additional decision procedures are described in 22 CFR 216.

AppendixE-2

USAID Environmental Procedures[1]

Text of Title 22, Code of Federal Regulations, Part 216

ENVIRONMENTAL PROCEDURES

These procedures have been revised based on experience with previous ones agreed to in settlement of a law suit brought against the Agency in 1975. The Procedures are Federal Regulations and therefore, it is imperative that they be followed in the development of Agency programs.

In preparing these Regulations, some interpretations and definitions have been drawn from Executive Order No. 12114 of 4 January 1979, on the application of the National Environmental Policy Act (NEPA) to extraterritorial situations. Some elements of the revised regulations on NEPA issued by the President's Council on Environmental Quality have also been adopted. Examples are: The definition of significant impact, the concept of scoping of issues to be examined in a formal analysis, and the elimination of certain USAID activities from the requirement for environmental review.

In addition, these procedures: 1) provide advance notice that certain types of projects will automatically require detailed environmental analysis thus eliminating one step in the former process and permitting early planning for this activity; 2) permit the use of specially prepared project design considerations or guidance to be substituted for environmental analysis in selected situations; 3) advocate the use of indigenous specialists to examine pre-defined issues during the project design stage; 4) clarify the role of the Bureau's Environmental Officer in the review and approval process, and 5) permit in certain circumstances, projects to go forward prior to completion of environmental analysis.

Note that only minimal clarification changes have been made in those sections dealing with the evaluation and selection of pesticides to be supported by USAID in projects or of a non-project assistance activity.

Authority: 42 U.S.C. 4332; 22 U.S.C. 2381.

Source: 41 FR 26913, June 30, 1976.

§216.1 INTRODUCTION

(a) Purpose

In accordance with sections 118(b) and 621 of the Foreign Assistance Act of 1961, as amended, (the FAA) the following general procedures shall be used by A.I.D. to ensure that environmental factors and

[1] Title 22 of the Code of Federal Regulations, Part 216, with preamble, is presented here in its entirety. Spelling errors have been corrected from the original to facilitate word searching. Represents the most recent revisions, as of October 9, 1980.

values are integrated into the A.I.D. decision-making process. These procedures also assign responsibility within the Agency for assessing the environmental effects of A.I.D.'s actions. These procedures are consistent with Executive Order 12114, issued January 4, 1979, entitled Environmental Effects Abroad of Major Federal Actions, and the purposes of the National Environmental Policy Act of 1970, as amended (42 U.S.C. 4371 et seq.)(NEPA). They are intended to implement the requirements of NEPA as they effect the A.I.D. program.

(b) Environmental Policy

In the conduct of its mandate to help upgrade the quality of life of the poor in developing countries, A.I.D. conducts a broad range of activities. These activities address such basic problems as hunger, malnutrition, overpopulation, disease, disaster, deterioration of the environment and the natural resource base, illiteracy as well as the lack of adequate housing and transportation. Pursuant to the FAA, A.I.D. provides development assistance in the form of technical advisory services, research, training, construction and commodity support. In addition. A.I.D. conducts programs under the Agricultural Trade Development and Assistance Act of 1954 (Pub. L. 480) that are designed to combat hunger, malnutrition and to facilitate economic development. Assistance programs are carried out under the foreign policy guidance of the Secretary of State and in cooperation with the governments of sovereign states. Within this framework, it is A.I.D. policy to:

(1) Ensure that the environmental consequences of A.I.D.-financed activities are identified and considered by A.I.D. and the host country prior to a final decision to proceed and that appropriate environmental safeguards are adopted;

(2) Assist developing countries to strengthen their capabilities to appreciate and effectively evaluate the potential environmental effects of proposed development strategies and projects, and to select, implement and manage effective environmental programs;

(3) Identify impacts resulting from A.I.D.'s actions upon the environment, including those aspects of the biosphere which are the common and cultural heritage of all mankind; and

(4) Define environmental limiting factors that constrain development and identify and carry out activities that assist in restoring the renewable resource base on which sustained development depends.

(c) Definitions

(1) CEQ Regulations. Regulations promulgated by the President's Council on Environmental Quality (CEQ) (Federal Register, Volume 43, Number 230, November 29, 1978) under the authority of NEPA and Executive Order 11514, entitled Protection and Enhancement of Environmental Quality (March 5, 1970) as amended by Executive Order 11991 (May 24, 1977).

(2) Initial Environmental Examination. An Initial Environmental Examination is the first review of the reasonably foreseeable effects of a proposed action on the environment. Its function is to provide a brief statement of the factual basis for a Threshold Decision as to whether an Environmental Assessment or an Environmental Impact Statement will be required.

(3) Threshold Decision. A formal Agency decision which determines, based on an Initial Environmental Examination, whether a proposed Agency action is a major action significantly affecting the environment.

(4) Environmental Assessment. A detailed study of the reasonably foreseeable significant effects, both beneficial and adverse, of a proposed action on the environment of a foreign country or countries.

(5) Environmental Impact Statement. A detailed study of the

reasonably foreseeable environmental impacts, both positive and negative, of a proposed A.I.D. action and its reasonable alternatives on the United States, the global environment or areas outside the jurisdiction of any nation as described in §216.7 of these procedures. It is a specific document having a definite format and content, as provided in NEPA and the CEQ Regulations. The required form and content of an Environmental Impact Statement is further described in §216.7 infra.

(6) Project Identification Document (PID). An internal A.I.D. document which initially identifies and describes a proposed project.

(7) Program Assistance Initial Proposal (PAIP). An internal A.I.D. document used to initiate and identify proposed non-project assistance, including commodity import programs. It is analogous to the PID.

(8) Project Paper (PP). An internal A.I.D. document which provides a definitive description and appraisal of the project and particularly the plan or implementation.

(9) Program Assistance Approval Document (PAAD). An internal A.I.D. document approving non-project assistance. It is analogous to the PP.

(10) Environment. The term environment, as used in these procedures with respect to effects occurring outside the United States, means the natural and physical environment. With respect to effects occurring within the United States see §216.7(b).

(11) Significant Effect. With respect to effects on the environment outside the United States, a proposed action has a significant effect on the environment if it does significant harm to the environment.

(12) Minor Donor. For purposes of these procedures, A.I.D. is a minor donor to a multidonor project when A.I.D. does not control the planning or design of the multidonor project and either

(i) A.I.D.'s total contribution to the project is both less than $1,000,000 and less than 25 percent of the estimated project cost, or

(ii) A.I.D.'s total contribution is more than $1,000,000 but less than 25 percent of the estimated project cost and the environmental procedures of the donor in control of the planning of design of the project are followed, but only if the A.I.D. Environmental Coordinator determines that such procedures are adequate.

§216.2 APPLICABILITY OF PROCEDURES

(a) Scope

Except as provided in §216.2(b), these procedures apply to all new projects, programs or activities authorized or approved by A.I.D. and to substantive amendments or extensions of ongoing projects, programs, or activities.

(b)Exemptions

(1) Projects, programs or activities involving the following are exempt from these procedures:

(i) International disaster assistance;

(ii) Other emergency circumstances; and

(iii) Circumstances involving exceptional foreign policy sensitivities.

(2) A formal written determination, including a statement of the justification therefore, is required for each project, program or activity for which an exemption is made under paragraphs (b)(l) (ii) and (iii) of this section, but is not required for projects, programs or activities under paragraph (b)(l)(i) of this section. The determination shall be made either by the Assistant Administrator having responsibility for the program, project or activity, or by the Administrator, where authority to approve financing has been reserved by the Administrator. The determination shall be made after consultation with CEQ regarding the environmental consequences of the proposed program, project or activity.

(c) Categorical Exclusions

(1) The following criteria have been applied in determining the classes of actions included in §216.2(c)(2) for which and Initial Environmental Examination, Environmental Assessment and Environmental Impact Statement generally are not required:

(i) The action does not have an effect on the natural or physical environment;

(ii) A.I.D. does not have knowledge of or control

over, and the objective of A.I.D. in furnishing assistance does not require, either prior to approval of financing or prior to implementation of specific activities, knowledge of or control over, the details of the specific activities that have an effect on the physical and natural environment for which financing is provided by A.I.D.;

(iii) Research activities which may have an affect on the physical and natural environment but will not have a significant effect as a result of limited scope, carefully controlled nature and effective monitoring.

(2) The following classes of actions are not subject to the procedures set forth in §216.3, except to the extent provided herein;

(i) Education, technical assistance, or training programs except to the extent such programs include activities directly affecting the environment (such as construction of facilities, etc.);

(ii) Controlled experimentation exclusively for the purpose of research and field evaluation which are confined to small areas and carefully monitored;

(iii)Analyses, studies, academic or research workshops and meetings;

(iv) Projects in which A.I.D. is a minor donor to a multidonor project and there is no potential significant effects upon the environment of the United States, areas outside any nation's jurisdiction or endangered or threatened species or their critical habitat;

(v) Document and information transfers;

(vi) Contributions to international, regional or national organizations by the United States which are not for the purpose of carrying out a specifically identifiable project or projects;

(vii) Institution building grants to

research and educational institutions in the United States such as those provided for under section 122(d) and Title XII of Chapter 2 of Part I of the FAA (22 USCA §§2151 p. (b) 2220a. (1979));

(viii) Programs involving nutrition, health care or population and family planning services except to the extent designed to include activities directly affecting the environment (such as

construction of facilities, water supply systems, waste water treatment, etc.)

(ix) Assistance provided under a Commodity Import Program when, prior to approval, A.I.D. does not have knowledge of the specific commodities to be financed and when the objective in furnishing such assistance requires neither knowledge, at the time the assistance is authorized, nor control, during implementation, of the commodities or their use in the host country.

(x) Support for intermediate credit institutions when the objective is to assist in the capitalization of the institution or part thereof and when such support does not involve reservation of the right to review and approve individual loans made by the institution;

(xi) Programs of maternal or child feeding conducted under Title II of Pub. L. 480;

(xii) Food for development programs conducted by food recipient countries under Title III of Pub. L. 480, when achieving A.I.D.'s objectives in such programs does not require knowledge of or control over the details of the specific activities conducted by the foreign country under such program;

(xiii) Matching, general support and institutional support grants provided to private voluntary organizations (PVOs) to assist in financing programs where A.I.D.'s objective in providing such financing does not require knowledge of or control over the details of the specific activities conducted by the PVO;

(xiv) Studies, projects or programs intended to develop the capability of recipient countries to engage in development planning, except to the extent designed to result in activities directly affecting the environment (such as construction of facilities, etc.); and

(xv) Activities which involve the application of design criteria or standards developed and approved by A.I.D.

(3) The originator of a project. program or activity shall determine the extent to which it is within the classes of actions described in paragraph (c)(2) of this section. This determination shall be made in writing and be submitted with the PID, PAIP or comparable

document. This determination, which must include a brief statement supporting application of the exclusion shall be reviewed by the Bureau Environmental Officer in the same manner as a Threshold Decision under §216.3(a)(2) of these procedures. Notwithstanding paragraph (c)(2) of this section, the procedures set forth in §216.3 shall apply to any project, program or activity included in the classes of actions listed in paragraph (c)(2) of this section, or any aspect or component thereof, if at any time in the design, review or approval of the activity it is determined that the project, program or activity, or aspect or component thereof, is subject to the control of A.I.D. and may have a significant effect on the environment.

(d) Classes of Actions Normally Having a Significant Effect on the Environment

(1) The following classes of actions have been determined generally to have a significant effect on the environment and an Environmental Assessment or Environmental Impact Statement, as appropriate, will be required:

(i) Programs of river basin development;

(ii) Irrigation or water management projects, including dams and impoundments;

(iii) Agricultural land leveling;

(iv) Drainage projects;

(v) Large scale agricultural mechanization;

(vi) New lands development;

(vii) Resettlement projects;

(viii) Penetration road building or road improvement projects;

(ix) Powerplants;

(x) Industrial plants;

(xi) Potable water and sewerage projects other than those that are small-scale.

(2) An Initial Environmental Examination normally will not be necessary for activities within the classes described in

§216.2(d), except when the originator of the project believes that the project will not have a significant effect on the environment. In such cases, the activity may be subjected to the procedures set forth in §216.3.

(e) Pesticides. The exemptions of §216.2(b)(l) and the categorical exclusions of §216.2(c)(2) are not applicable to assistance for the procurement or use of pesticides.

§216.3 PROCEDURES

(a) General Procedures

(1) Preparation of the Initial Environmental Examination. Except as otherwise provided, an Initial Environmental Examination is not required for activities identified in §216.2(b)(1), (c)(2), and (d). For all other A.I.D. activities described in §216.2(a) an Initial Environmental Examination will be prepared by the originator of an action. Except as indicated in this section, it should be prepared with the PID or PAIP. For projects including the procurement or use of pesticides, the procedures set forth in §216.3(b) will be followed, in addition to the procedures in this paragraph. Activities which cannot be identified in sufficient detail to permit the completion of an Initial Environmental Examination with the PID or PAIP, shall be described by including with the PID or PAIP:

(i) An explanation indicating why the Initial Environmental Examination cannot be completed;

(ii) an estimate of the amount of time required to complete the Initial Environmental Examination; and

(iii) a recommendation that a Threshold Decision be deferred until the Initial Environmental Examination is completed. The responsible Assistant Administrator will act on the request for deferral concurrently with action on the PID or PAIP and will designate a time for completion of the Initial Environmental Examination. In all instances, except as provided in

§216.3(a)(7), this completion date will be in sufficient time to allow for the completion of an Environmental Assessment or Environmental Impact Statement, if required, before a final decision is made to provide A.I.D. funding for the action.

(2) Threshold Decision. (i) The Initial Environmental Examination will include a Threshold Decision made by the officer in the originating office who signs the PID or PAIP. If the Initial Environmental Examination is completed prior to or at the same time as the PID or PAIP, the Threshold Decision will be reviewed by the Bureau Environmental Officer concurrently with approval of the PID or PAIP. The Bureau Environmental Officer will either concur in the Threshold Decision or request reconsideration by the officer who made the Threshold Decision, stating the reasons for the request. Differences of opinion between these officers shall be submitted for resolution to the Assistant Administrator at the same time that the PID is submitted for approval.

(ii) An Initial Environmental Examination, completed subsequent to approval of the PID or PAIP, will be forwarded immediately together with the Threshold Determination to the Bureau Environmental Officer for action as described in this section.

(iii) A Positive Threshold Decision shall result from a finding that the proposed action will have a significant effect on the environment. An Environmental Impact Statement shall be prepared if required pursuant to §216.7. If an impact statement is not required, an Environmental Assessment will be prepared in accordance with §216.6. The cognizant Bureau or Office will record a Negative Determination if the proposed action will not have a significant effect on the environment.

(3) Negative Declaration. The Assistant Administrator, or the Administrator in actions for which the approval of the Administrator is required for the authorization of financing, may make a Negative Declaration, in writing, that the Agency will not develop an Environmental Assessment or an Environmental Impact Statement regarding an action found to have a significant effect on the environment when (i) a substantial number of Environmental Assessments or Environmental Impact Statements relating to similar activities have been prepared in the past, if relevant to the proposed action, (ii) the Agency has previously prepared a programmatic Statement or Assessment covering the activity in question which has been considered in the development of such activity, or (iii) the Agency has developed design criteria for such an action which, if applied in the design of the action, will avoid a significant effect on the environment.

(4) Scope of Environmental Assessment or Impact Statement

(i) Procedure and Content. After a Positive Threshold Decision has been made, or a determination is made under the pesticide procedures set forth in §216.3(b) that an Environmental Assessment or Environmental Impact Statement is required, the originator of the action shall commence the process of identifying the significant issues relating to the proposed action and of determining the scope of the issues to be addressed in the Environmental Assessment or Environmental Impact Statement. The originator of an action within the classes of actions described in §216.2(d) shall commence this scoping process as soon as practicable. Persons having expertise relevant to the environmental aspects of the proposed action shall also participate in this scoping process. (Participants may include but are not limited to representatives of host governments, public and private institutions, the A.I.D. Mission staff and contractors.) This process shall result in a written statement which shall include the following matters:

(a) A determination of the scope and significance of issues to be analyzed in the Environmental Assessment or Impact Statement, including direct and indirect effects of the project on the environment.

(b) Identification and elimination from detailed study of the issues that are not significant or have been covered by earlier environmental review, or approved design considerations, narrowing the discussion of these issues to a brief presentation of why they will not have a significant effect on the environment.

(c) A description of

(1) the timing of the preparation of environmental analyses, including phasing if appropriate,

(2) variations required in the format of the Environmental Assessment, and

(3) the tentative planning and decision-making schedule; and

(d) A description of how the analysis will be conducted and the disciplines that will participate in the analysis.

(ii) These written statements shall be reviewed and approved by the Bureau Environmental Officer.

(iii) Circulation of Scoping Statement. To assist in the preparation of an Environmental Assessment, the Bureau Environmental Officer may circulate copies of the written statement, together with a request for written comments, within thirty days, to selected federal agencies if that Officer believes comments by such federal agencies will be useful in the preparation of an Environmental Assessment. Comments received from reviewing federal agencies will be considered in the preparation of the Environmental Assessment and in the formulation of the design and implementation of the project, and will, together with the scoping statement, be included in the project file.

(iv) Change in Threshold Decision. If it becomes evident that the action will not have a significant effect on the environment (i.e., will not cause significant harm to the environment), the Positive Threshold Decision may be withdrawn with the concurrence of the Bureau Environmental Officer. In the case of an action included in §216.2(d)(2), the request for withdrawal shall be made to the Bureau Environmental Officer.

(5) Preparation of Environmental Assessments and Environmental Impact Statement. If the PID or PAIP is approved, and the Threshold Decision is positive, or the action is included in §216.2(d), the originator of the action will be responsible for the preparation of an Environmental Assessment or Environmental Impact Statement as required. Draft Environmental Impact Statements will be circulated for review and comment as part of the review of Project Papers and as outlined further in §216.7 of those procedures. Except as provided in §216.3(a)(7), final approval of the PP or PAAD and the method of implementation will include consideration of the Environmental Assessment or final Environmental Impact Statement.

(6) Processing and Review Within A.I.D.

(i) Initial Environmental Examinations, Environmental Assessments, and final Environmental Impact Statements will be processed pursuant to standard A.I.D. procedures for project approval documents. Except as provided in §216.3(a)(7), Environmental Assessments and final Environmental Impact Statements will be reviewed as an integral part of the Project Paper or equivalent document. In addition to these procedures, Environmental Assessments will be reviewed and cleared by the Bureau Environmental Officer. They may also be reviewed by the Agency's Environmental Coordinator who will monitor the Environmental Assessment process.

(ii) When project approval authority is delegated to field posts, Environmental Assessments shall be reviewed and cleared by the Bureau Environmental Officer prior to the approval of such actions.

(iii) Draft and final Environmental Impact Statements will be reviewed and cleared by the Environmental Coordinator and the Office of the General Counsel.

(7) Environmental Review After Authorization of Financing.

(i) Environmental review may be performed after authorization of a project, program or activity only with respect to subprojects or significant aspects of the project, program or activity that are unidentified at the time of authorization. Environmental review shall be completed prior to authorization for all subprojects and aspects of a project, program or activity that are identified.

(ii) Environmental review should occur at the earliest time in design or implementation at which a meaningful review can be undertaken, but in no event later than when previously unidentified subprojects or aspects of projects, programs or activities are identified and planned. To the extent possible, adequate information to undertake deferred environmental review should be obtained before funds are obligated for unidentified subprojects or aspects of projects, programs or activities. (Funds may be obligated for the other aspects for which environmental review has been completed.) To avoid an irreversible commitment of resources prior to the conclusion of environmental review, the obligation of funds can be made

incrementally as subprojects or aspects of projects, programs or activities are identified; or if necessary while planning continues, including environmental review, the agreement or other document obligating funds may contain appropriate covenants or conditions precedent to disbursement for unidentified subprojects or aspects of projects, programs or activities.

(iii) When environmental review must be deferred beyond the time some of the funds are to be disbursed (e.g., long lead times for the delivery of goods or services), the project agreement or other document obligating funds shall contain a covenant or covenants requiring environmental review, including an Environmental Assessment or Environmental Impact Statement, when appropriate, to be completed and taken into account prior to implementation of those subprojects or aspects of the project, program or activity for which environmental review is deferred. Such covenants shall ensure that implementation plans will be modified in accordance with environmental review if the parties decide that modifications are necessary.

(iv) When environmental review will not be completed for an entire project, program or activity prior to authorization, the Initial Environmental Examination and Threshold Decision required under §216.3(a)(l) and (2) shall identify those aspects of the project, program or activity for which environmental review will be completed prior to the time financing is authorized. It shall also include those subprojects or aspects for which environmental review will be deferred, stating the reasons for deferral and the time when environmental review will be completed. Further, it shall state how an irreversible commitment of funds will be avoided until environmental review is completed. The A.I.D. officer responsible for making environmental decisions for such projects, programs or activities shall also be identified (the same officer who has decision-making authority for the other aspects of implementation). This deferral shall be reviewed and approved by the officer making the Threshold Decision and the officer who authorizes the project, program or activity. Such approval may be made only after consultation with the Office of General Counsel for the purpose of establishing the manner in which conditions precedent to disbursement or covenants in project and other agreements will avoid an irreversible commitment of resources before environmental review is completed.

(8) Monitoring. To the extent feasible and relevant, projects and programs for which Environmental Impact Statements or Environmental Assessments have been prepared should be designed to include measurement of any changes in environmental quality, positive or negative, during their implementation. This will require recording of baseline data at the start. To the extent that available data permit, originating offices of A.I.D. will formulate systems in collaboration with recipient nations, to monitor such impacts during the life of A.I.D.'s involvement. Monitoring implementation of projects, programs and activities shall take into account environmental impacts to the same extent as other aspects of such projects, programs and activities. If during implementation of any project, program or activity, whether or not an Environmental Assessment or Environmental Impact Statement was originally required, it appears to the Mission Director, or officer responsible for the project, program or activity, that it is having or will have a significant effect on the environment that was not previously studied in an Environmental Assessment or Environmental Impact Statement, the procedures contained in this part shall be followed including, as appropriate, a Threshold Decision, Scoping and an Environmental Assessment or Environmental Impact Statement.

(9) Revisions. If, after a Threshold Decision is made resulting in a Negative Determination, a project is revised or new information becomes available which indicates that a proposed action might be "major" and its effects "significant", the Negative Determination will be reviewed and revised by the cognizant Bureau and an Environmental Assessment or Environmental Impact Statement will be prepared, if appropriate. Environmental Assessments and Environmental Impact Statements will be amended and processed appropriately if there are major changes in the project or program, or if significant new information becomes available which relates to the impact of the project,

program or activity on the environment that was not considered at the time the Environmental Assessment or Environmental Impact Statement was approved. When ongoing programs are revised to incorporate a change in scope or nature, a determination will be made as to whether such change may have an environmental impact not previously assessed. If so, the procedures outlined in this part will be followed.

(10) Other Approval Documents. These procedures refer to certain A.I.D. documents such as PIDs, PAIPs, PPs and PAADs as the A.I.D. internal instruments for approval of projects, programs or activities. From time to time, certain special procedures, such as those in §216.4, may not require the use of the aforementioned documents. In these situations, these environmental procedures shall apply to those special approval procedures, unless otherwise exempt, at approval times and levels comparable to projects, programs and activities in which the aforementioned documents are used.

(b) Pesticide Procedures

(1) Project Assistance. Except as provided in §216.3 (b)(2), all proposed projects involving assistance for the procurement or use, or both, of pesticides shall be subject to the procedures prescribed in §216.3(b)(l)(i) through (v). These procedures shall also apply, to the extent permitted by agreements entered into by A.I.D. before the effective date of these pesticide procedures, to such projects that have been authorized but for which pesticides have not been procured as of the effective date of these pesticide procedures.

(i) When a project includes assistance for procurement or use, or both, of pesticides registered for the same or similar uses by USEPA without restriction, the Initial Environmental Examination for the project shall include a separate section evaluating the economic, social and environmental risks and benefits of the planned pesticide use to determine whether the use may result in significant environmental impact. Factors to be considered in such an evaluation shall include, but not be limited to the following:

(a) The USEPA registration status of the requested pesticide;

(b) The basis for selection of the requested pesticide;

(c) The extent to which the proposed pesticide use is part of an integrated pest management program;

(d) The proposed method or methods of application, including availability of appropriate application and safety equipment;

(e) Any acute and long-term toxicological hazards, either human or environmental, associated with the proposed use and measures available to minimize such hazards;

(f) The effectiveness of the requested pesticide for the proposed use;

(g) Compatibility of the proposed pesticide with target and nontarget ecosystems;

(h) The conditions under which the pesticide is to be used, including climate, flora, fauna, geography, hydrology, and soils;

(i) The availability and effectiveness of other pesticides or nonchemical control methods;

(j) The requesting country's ability to regulate or control the distribution, storage, use and disposal of the requested pesticide;

(k) The provisions made for training of users and applicators; and

(l) The provisions made for monitoring the use and effectiveness of the pesticide.

In those cases where the evaluation of the proposed pesticide use in the Initial Environmental Examination indicates that the use will significantly effect the human environment, the Threshold Decision will include a recommendation for the preparation of an Environmental Assessment or Environmental Impact Statement, as appropriate. In the event a decision is made to approve the planned pesticide use, the Project Paper shall include to the extent practicable, provisions designed to mitigate potential adverse effects of the pesticide. When the pesticide evaluation section

of the Initial Environmental Examination does not indicate a potentially unreasonable risk arising from the pesticide use, an Environmental Assessment or Environmental Impact Statement shall nevertheless be prepared if the environmental effects of the project otherwise require further assessment.

(ii) When a project includes assistance for the procurement or use, or both, of any pesticide registered for the same or similar uses in the United States but the proposed use is restricted by the USEPA on the basis of user hazard, the procedures set forth in §216.3(b)(1)(i) above will be followed. In addition, the Initial Environmental Examination will include an evaluation of the user hazards associated with the proposed USEPA restricted uses to ensure that the implementation plan which is contained in the Project Paper incorporates provisions for making the recipient government aware of these risks and providing, if necessary, such technical assistance as may be required to mitigate these risks. If the proposed pesticide use is also restricted on a basis other than user hazard, the procedures in §216.3(b)(l)(iii) shall be followed in lieu of the procedures in this section.

(iii) If the project includes assistance for the procurement or use, or both of:

(a) Any pesticide other than one registered for the same or similar uses by USEPA without restriction or for restricted use on the basis of user hazard; or

(b) Any pesticide for which a notice of rebuttable presumption against reregistration, notice of intent to cancel, or notice of intent to suspend has been issued by USEPA,

The Threshold Decision will provide for the preparation of an Environmental Assessment or Environmental Impact Statement, as appropriate (§216.6(a)). The EA or EIS shall include, but not be limited to, an analysis of the factors identified in

§216.3(b)(l)(i) above.

(iv) Notwithstanding the provisions of §216.3(b)(l)(i) through (iii) above, if the project includes assistance for the procurement or use, or both, of a pesticide against which USEPA has initiated a regulatory action for cause, or for which it has issued a notice of rebuttable presumption against reregistration, the nature of the action or notice, including the relevant technical and scientific factors will be discussed with the requesting government and considered in the IEE and, if prepared, in the EA or EIS. If USEPA initiates any of the regulatory actions above against a pesticide subsequent to its evaluation in an IEE, EA or EIS, the nature of the action will be discussed with the recipient government and considered in an amended IEE or amended EA or EIS, as appropriate.

(v) If the project includes assistance for the procurement or use, or both of pesticides but the specific pesticides to be procured or used cannot be identified at the time the IEE is prepared, the procedures outlined in §216.3(b)(i) through (iv) will be followed when the specific pesticides are identified and before procurement or use is authorized. Where identification of the pesticides to be procured or used does not occur until after Project Paper approval, neither the procurement nor the use of the pesticides shall be undertaken unless approved, in writing, by the Assistant Administrator (or in the case of projects authorized at the Mission level, the Mission Director) who approved the Project Paper.

(2) Exceptions to Pesticide Procedures. The procedures set forth in §216.3 (b)(l) shall not apply to the following projects including assistance for the procurement or use, or both, of pesticides.

(i) Projects under emergency conditions.

Emergency conditions shall be deemed to exist when it is determined by the Administrator, A.I.D.. in writing that:

(a) A pest outbreak has occurred or is imminent; and

(b) Significant health problems (either human or animal) or significant economic problems will occur without the prompt use of the proposed pesticide; and

(c) Insufficient time is available before the pesticide must be used to evaluate the proposed use in accordance with the provisions of this regulation.

(ii) Projects where A.I.D. is a minor donor, as defined in

§216.1(c)(12) above, to a multi-donor project.

(iii) Projects including assistance for procurement or use, or both, of pesticides for research or limited field evaluation purposes by or under the supervision of project personnel. In such instances, however, A.I.D. will ensure that the manufacturers of the pesticides provide toxicological and environmental data necessary to safeguard the health of research personnel and the quality of the local environment in which the pesticides will be used. Furthermore, treated crops will not be used for human or animal consumption unless appropriate tolerances have been established by EPA or recommended by FAO/WHO, and the rates and frequency of application, together with the prescribed preharvest intervals, do not result in residues exceeding such tolerances. This prohibition does not apply to the feeding of such crops to animals for research purposes.

(3) Non-Project Assistance. In a very few limited number of circumstances A.I.D. may provide non-project assistance for the procurement and use of pesticides. Assistance in such cases shall be provided if the A.I.D. Administrator determines in writing that

(i) emergency conditions, as defined in §216.3(b)(2)(i) above exist; or

(ii) that compelling circumstances exist such that failure to provide the proposed assistance would seriously impede the attainment of U.S. foreign policy objectives or the objectives of the foreign assistance program. In the latter case, a decision to provide the assistance will be based to the maximum extent practicable, upon a consideration of the factors set forth in §216.3(b)(l)(i) and, to the extent available, the history of efficacy and safety covering the past use of the pesticide the in recipient country.

§216.4 PRIVATE APPLICANTS

Programs, projects or activities for which financing from A.I.D. is sought by private applicants, such as PVOs

and educational and research institutions, are subject to these procedures. Except as provided in §216.2(b), (c) or (d), preliminary proposals for financing submitted by private applicants shall be accompanied by an Initial Environmental Examination or adequate information to permit preparation of an Initial Environmental Examination. The Threshold Decision shall be made by the Mission Director for the country to which the proposal relates, if the preliminary proposal is submitted to the A.I.D. Mission, or shall be made by the officer in A.I.D. who approves the preliminary proposal. In either case, the concurrence of the Bureau Environmental Officer is required in the same manner as in §216.3(a)(2), except for PVO projects approved in A.I.D. Missions with total life of project costs less than $500,000. Thereafter, the same procedures set forth in §216.3 including as appropriate scoping and Environmental Assessments or Environmental Impact Statements, shall be applicable to programs, projects or activities submitted by private applicants. The final proposal submitted for financing shall be treated, for purposes of these procedures, as a Project Paper. The Bureau Environmental Officer shall advise private applicants of studies or other information foreseeably required for action by A.I.D.

§216.5 ENDANGERED SPECIES

It is A.I.D. policy to conduct its assistance programs in a manner that is sensitive to the protection of endangered or threatened species and their critical habitats. The Initial Environmental Examination for each project, program or activity having an effect on the environment shall specifically determine whether the project, program or activity will have an effect on an endangered or threatened species, or critical habitat. If the proposed project, program or activity will have the effect of jeopardizing an endangered or threatened species or of adversely modifying its critical habitat, the Threshold Decision shall be a Positive Determination and an Environmental Assessment or Environmental Impact Statement completed as appropriate, which shall discuss alternatives or modifications to avoid or mitigate such impact on the species or its habitat.

§216.6 ENVIRONMENTAL ASSESSMENTS

(a) General Purpose

The purpose of the Environmental Assessment is to provide Agency and host country decision-makers with a full discussion of significant environmental effects of a proposed action. It includes alternatives which would avoid or minimize adverse effects or enhance the quality of the environment so that the expected benefits of development objectives can be weighed against any adverse impacts upon the human environment or any irreversible or irretrievable commitment of resources.

(b) Collaboration with Affected Nation on Preparation

Collaboration in obtaining data, conducting analyses and considering alternatives will help build an awareness of development associated environmental problems in less developed countries as well as assist in building an indigenous institutional capability to deal nationally with such problems. Missions, Bureaus and Offices will collaborate with affected countries to the maximum extent possible, in the development of any Environmental Assessments and consideration of environmental consequences as set forth therein.

(c) Content and Form

The Environmental Assessment shall be based upon the scoping statement and shall address the following elements, as appropriate:

(1) Summary. The summary shall stress the major conclusions, areas of controversy, if any, and the issues to be resolved.

(2) Purpose. The Environmental Assessment shall briefly specify the underlying purpose and need to which the Agency is responding in proposing the alternatives including the proposed action.

(3) Alternatives Including the Proposed Action. This section should present the environmental impacts of the proposal and its alternatives in comparative form, thereby sharpening the issues and providing a clear basis for choice among options by the decision-maker. This section should explore and evaluate reasonable alternatives and briefly discuss the reasons for eliminating those alternatives which were not included in the detailed study; devote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits; include the alternative of no action; identify the Agency's preferred alternative or alternatives, if one or more exists; include appropriate mitigation measures not already included in the proposed action or alternatives.

(4) Affected Environment. The Environmental Assessment shall succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration. The descriptions shall be no longer than is necessary to understand the effects of the alternatives. Data and analyses in the Environmental Assessment shall be commensurate with the significance of the impact with less important material summarized, consolidated or simply referenced.

(5) Environmental Consequences. This section forms the analytic basis for the comparisons under paragraph (c)(3) of this section. It will include the environmental impacts of the alternatives including the proposed action; any adverse effects that cannot be avoided should the proposed action be implemented; the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity; and any irreversible or irretrievable commitments of resources which would be involved in the proposal should it be implemented. It should not duplicate discussions in paragraph (c)(3) of this section. This section of the Environmental Assessment should include discussions of direct effects and their significance; indirect effects and their significance; possible conflicts between the proposed action and land use plans, policies and controls for the areas concerned; energy requirements and conservation potential of various alternatives and mitigation measures; natural or depletable resource requirements and conservation poten-

tial of various requirements and mitigation measures; urban quality; historic and cultural resources and the design of the built environment, including the reuse and conservation potential of various alternatives and mitigation measures; and means to mitigate adverse environmental impacts.

(6) List of Preparers. The Environmental Assessment shall list the names and qualifications (expertise, experience, professional discipline) of the persons primarily responsible for preparing the Environmental Assessment or significant background papers.

(7) Appendix. An appendix may be prepared.

(d) Program Assessment

Program Assessments may be appropriate in order to assess the environmental effects of a number of individual actions and their cumulative environmental impact in a given country or geographic area, or the environmental impacts that are generic or common to a class of agency actions, or other activities which are not country-specific. In these cases, a single, programmatic assessment will be prepared in A.I.D./Washington and circulated to appropriate overseas Missions, host governments, and to interested parties within the United States. To the extent practicable, the form and content of the programmatic Environmental Assessment will be the same as for project Assessments. Subsequent Environmental Assessments on major individual actions will only be necessary where such follow-on or subsequent activities may have significant environmental impacts on specific countries where such impacts have not been adequately evaluated in the programmatic Environmental Assessment. Other programmatic evaluations of class of actions may be conducted in an effort to establish additional categorical exclusions or design standards or criteria for such classes that will eliminate or minimize adverse effects of such actions, enhance the environmental effect of such actions or reduce the amount of paperwork or time involved in these procedures. Programmatic evaluations conducted for the purpose of establishing additional categorical exclusions under §216.2(c) or design considerations that will eliminate significant effects for classes of actions shall be made available for public comment before the categorical exclusions or design standards or criteria are adopted by A.I.D. Notice of the availability of such documents shall be published in the Federal Register. Additional categorical exclusions shall be adopted by A.I.D. upon the approval of the Administrator, and design

consideration in accordance with usual agency procedures.

(e) Consultation and Review

(1) When Environmental Assessments are prepared on activities carried out within or focused on specific developing countries, consultation will be held between A.I.D. staff and the host government both in the early stages of preparation and on the results and significance of the completed Assessment before the project is authorized.

(2) Missions will encourage the host government to make the Environmental Assessment available to the general public of the recipient country. If Environmental Assessments are prepared on activities which are not country specific, the Assessment will be circulated by the Environmental Coordinator to A.I.D.'s Overseas Missions and interested governments for information, guidance and comment and will be made available in the U.S. to interested parties.

(f) Effect in Other Countries

In a situation where an analysis indicates that potential effects may extend beyond the national boundaries of a recipient country and adjacent foreign nations may be affected, A.I.D. will urge the recipient country to consult with such countries in advance of project approval and to negotiate mutually acceptable accommodations.

(g) Classified Material

Environmental Assessments will not normally include classified or administratively controlled material. However, there may be situations where environmental aspects cannot be adequately discussed

without the inclusion of such material. The handling and disclosure of classified or administratively controlled material shall be governed by 22 CFR Part 9. Those portions of an Environmental Assessment which are not classified or administratively controlled will be made available to persons outside the Agency as provided for in 22 CFR Part 212.

§216.7 ENVIRONMENTAL IMPACT STATEMENTS

(a) Applicability

An Environmental Impact Statement shall be prepared when agency actions significantly affect:

(1) The global environment or areas outside the jurisdiction of any nation (e.g., the oceans);

(2) The environment of the United States; or

(3) Other aspects of the environment at the discretion of the Administrator.

(b) Effects on the United States: Content and Form

An Environmental Impact Statement relating to paragraph (a)(2) of this section shall comply with the CEQ Regulations. With respect to effects on the United States, the terms environment and significant effect wherever used in these procedures have the same meaning as in the CEQ Regulations rather than as defined in §216.l(c)(12) and (13) of these procedures.

(c) Other Effects: Content and Form

An Environmental Impact Statement relating to paragraphs (a)(l) and (a)(3) of this section will generally follow the CEQ Regulations, but will take into account the special considerations and concerns of A.I.D. Circulation of such Environmental Impact Statements in draft form will precede approval of a Project Paper or equivalent and comments from such circulation will be considered before final project authorization as outlined in §216.3 of these procedures. The draft Environmental Impact Statement will also be circulated by the Missions to affected foreign governments for information and comment. Draft Environmental Impact Statements generally will be made available for comment to Federal agencies with jurisdiction by law or special expertise with respect to any environmental impact involved, and to public and private organizations and individuals for not less than forty-five (45) days. Notice of availability of the draft Environmental Impact Statements will be published in the FEDERAL REGISTER. Cognizant Bureaus and Offices will submit these drafts for circulation through the Environmental Coordinator who will have the responsibility for coordinating all such communications with persons outside A.I.D. Any comments received by the Environmental Coordinator will be forwarded to the originating Bureau or Office for consideration in final policy decisions and the preparation of a final Environmental Impact Statement. All such comments will be attached to the final Statement, and those relevant comments not adequately discussed in the draft Environmental Impact Statement will be appropriately dealt with in the final Environmental Impact Statement. Copies of the final Environmental Impact Statement, with comments attached, will be sent by the Environmental Coordinator to CEQ and to all other Federal, state, and local agencies and private organizations that made substantive comments on the draft, including affected foreign governments. Where emergency circumstances or considerations of foreign policy make it necessary to take an action without observing the provisions of §1506.10 of the CEQ Regulations, or when there are overriding considerations of expense to the United States or foreign governments, the originating Office will advise the Environmental Coordinator who will consult with Department of State and CEQ concerning appropriate modification of review procedures.

§216.8 PUBLIC HEARINGS

(a) In most instances AID will be able to gain the benefit of public participation in the impact statement process through circulation of draft statements and

notice of public availability in CEQ publications. However, in some cases the Administrator may wish to hold public hearings on draft Environmental Impact Statements. In deciding whether or not a public hearing is appropriate, Bureaus in conjunction with the Environmental Coordinator should consider:

(1) The magnitude of the proposal in terms of economic costs, the geographic area involved, and the uniqueness or size of commitment of the resources involved;

(2) The degree of interest in the proposal as evidenced by requests from the public and from Federal, state and local authorities, and private organizations and individuals, that a hearing be held;

(3) The complexity of the issue and likelihood that information will be presented at the hearing which will be of assistance to the Agency; and

(4) The extent to which public involvement already has been achieved through other means, such as earlier public hearings, meetings with citizen representatives, and/or written comments on the proposed action.

(b) If public hearings are held, draft Environmental Impact Statements to be discussed should be made available to the public at least fifteen (15) days prior to the time of the public hearings, and a notice will be placed in the FEDERAL REGISTER giving the subject, time and place of the proposed hearings.

§216.9 BILATERAL AND MULTILATERAL STUDIES AND CONCISE REVIEWS OF ENVIRONMENTAL ISSUES

Notwithstanding anything to the contrary in these procedures, the Administrator may approve the use of either of the following documents as a substitute for an Environmental Assessment (but not a substitute for an Environmental Impact Statement) required under these procedures:

(a) Bilateral or multilateral environmental studies, relevant or related to the proposed action, prepared by the United States and one or more foreign countries or by an international body or organization in which the United States is a member or participant; or

(b) Concise reviews of the environmental issues involved including summary environmental analyses or other appropriate documents.

§216.10 RECORDS AND REPORTS

Each Agency Bureau will maintain a current list of activities for which Environmental Assessments and Environmental Impact Statements are being prepared and for which Negative Determinations and Declarations have been made. Copies of final Initial Environmental Examinations, scoping statements, Assessments and Impact Statements will be available to interested Federal agencies upon request. The cognizant Bureau will maintain a permanent file (which may be part of its normal project files) of Environmental Impact Statements, Environmental Assessments, final Initial Environmental Examinations, scoping statements, Determinations and Declarations which will be available to the public under the Freedom of Information Act. Interested persons can obtain information or status reports regarding Environmental Assessments and Environmental Impact Statements through the A.I.D. Environmental Coordinator.

(22 U.S.C. 2381; 42 U.S.C. 4332)
Dated October 9, 1980
Joseph C. Wheeler
Acting Administrator

AppendixF

List of Key Contacts and Reviewers[1]

USAID

Africa Bureau

Office of Sustainable Development

AFR/SD/PSGE: Dan Dworkin, Environmental Monitoring Advisor,; John Gaudet, Bureau Environmental Coordinator; Walter I. Knausbenberger, Environmental Advisor, Pest Management Specialist; Mike McGahuey, Sustainable Agriculture Advisor; Tim Resch, Biodiversity Advisor; Tony Pryor, Natural Resources Policy Advisor

Office of Development Planning

Michelle Adams-Mattson, Curt Grimm, John Magistro

REDSO/ESA, Nairobi

Charlotte Bingham, Joao de Queiroz and Richard Pellek, Regional Environmental Officers

REDSO/WCA, Abidjan

Idrissa Samba, Regional Environmental Advisor; Wayne McDonald, Regional Environmental Officer

USAID/Gambia

Gary Cohen, ANR Officer

USAID/Mozambique

Robin Mason, Mission Environmental Officer

Asia Bureau

Molly Kux and Jeffrey Goodson, Bureau Environmental Officers

Global Bureau

Sheila Young, Todd Harding, and Phil Roark—Water and Sanitation for Health (WASH) Project

Global Bureau Environment Center

Biodiversity Support Program

Bruce Liehey, Bruce Mobry, Kate Newman, Elizabeth Boo.

EPAT Project

Rich Tobin, Policy Analyst

Forestry Support Program, USFS

Mark Buccowich, Robin Maille, Julia Morris

Women in Development Program

Martin Huit, Nancy Diamond

Latin America and Caribbean Bureau

Karen Menczer, Bureau Environmental Office

Policy and Program Coordination Bureau

Jim Hester, Agency Environmental Coordinator

General Counsel's Office/Africa

Mary Alice Kleinjen, Drew Luten, Pauline Johnson

NONGOVERNMENTAL ORGANIZATIONS

Adventist Relief and Development Agency: Robert Holbrook

African Center for Technology Studies (ACTS): Patrick Karani

Africare/Niger: Paul and Carol Wild

CARE/Mozambique: Jonathan White

Catholic Relief Services: Dennis Johnson

Christian Children's Fund: Dan Whyner

1 Those, who in their present or former capacities, provided information or reviewed these guidelines.

CODEL: Nancy Wright

Environmental Defense Fund: Chris Ashor

InterAction: Lisa Freund-Rosenblatt

PACT (Private Agencies Collaborating Together): Bob Richards

PLAN International: Bob Richards, Caryl Garcia,

PVO/NGO NRMS (Natural Resource Management Support) Project: Michael Brown, Kerry O'Connor

World Resources Institute (WRI): Walter Arensberg, Jake Brunner, Dan Tunstall, Lori Ann Thrupp

OTHER ORGANIZATIONS

North Carolina State Univeristy: Thurman Grove

U.S. Peace Corps, OTAPS, Washington, D.C.: Roberta Bimis, George Mahaffey

U.S. Evironmental Proection Agency, Region VII: Peter Sam

World Bank: Simon A. Rietbergen, Forestry; Jean-Roger Mercier, Environmental Assessment

CONSULTANTS

Angel Chiri, Pest Management, TR&D, EPAT

William Booth, Local Community Participation

Weston Fisher, Environmental and Natural Resources Management and Assessment, TR&D

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