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ENVIRONMENT AND NATURAL RESOURCES: Strategies for Sustainable Agriculture

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ENVIRONMENT AND NATURAL RESOURCES:
Strategies for Sustainable Agriculture

A Task Force Report
of the
Board for International Food
and Agricultural Development

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BIFAD TASK FORCE ON THE ENVIRONMENT AND NATURAL RESOURCES
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In the short time this Task Force has had to complete its assignment it has not been possible to review all relevant programs nor to hear the views of the many knowledgeable persons on this topic. We were, however, able to interact with a number of individuals in USAID and from other organizations. The Task Force benefitted greatly from these persons and would like to acknowledge their contributions.

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EXECUTIVE SUMMARY

Environmental degradation and deterioration of the natural resource base threatens the long-term "sustainability" of agricultural systems on which much of the developing world's food supply depends. This calls for a re-evaluation of the approach to all agricultural projects by donor agencies, host-country governments, and all universities involved in international development.

In October, 1987, the Board for International Food and Agricultural Development (BIFAD) formed a Task Force to focus on the role that the Title XII partnership should take in addressing this very important and timely issue. The Task Force looks upon the concept of sustainability as a way of examining and evaluating all aspects of agricultural development to be certain that objectives are realistic and that results will meet the needs of this and future generations.

This report provides an analysis of the key problems and obstacles to agricultural sustainability that have produced the current concerns; identifies some strategies for dealing with these concerns; outlines the particular contributions Title XII institutions have made; and provides some specific recommendations to BIFAD regarding its approach to environmental improvement and sustainable agriculture.

An Overview of the Problem

There is ample evidence that many of the attempts by the people in the developing world to meet their basic needs for food, fiber, fuel wood and other forest products are leading to environmental degradation and loss of biological diversity. This problem is greater in countries where population is increasing rapidly, poverty is prevalent, and per capita food production is stagnant or declining. In addition, some countries have a very limited and fragile resource base with few opportunities to expand.

The environmental implications of agricultural development programs are difficult to evaluate due to the complexity of agro-ecological systems. Many natural resource and environmental problems are not confined to country boundaries or political entities. There are also off-farm impacts of agricultural production and many interactions between agriculture and associated industrial development.

Government policies in developing countries are not always supportive of environmental protection and natural resource conservation. Pressures to produce for the short-term tend to override the concern for future generations. This often leads to the selection of inappropriate agricultural practices.

The Title XII Experience

More than ten years of experience with Title XII clearly shows that the legislation was sound and effective. With more emphasis on environment, natural resource conservation and sustainability, new opportunities have emerged for involvement of the U.S. universities and other members of the Title XII partnership. These new challenges will require greater use of a wide range of scientific expertise. Also, a broader interpretation of the Title XII mandate is appropriate.

USAID Programs and Initiatives

The Task Force was pleased to find that policies and programs of USAID are increasingly sensitive to natural resource conservation and environmental concerns. Agency programs now support research, technology transfer, training and institution development on a range of environmentally related issues. It remains to be seen if this commitment at the Washington level will result in changes for the farmer or pastoralist.

The Agency has utilized the extensive experience of the USDA, particularly the Soil Conservation Service and the Forest Service in overseas resource conservation programs. Also emphasis on an "environmental dialogue" with leaders of countries receiving U.S. development assistance represents an important addition to the long-standing policy dialogue with these countries.

Strategies for Sustainability

Ten different strategies necessary to environmental improvement and sustained use of natural resources are discussed in this report. Some of the components of these strategies are outlined with recommendations for implementation. Special attention is given to the advantages of greater utilization of the USAID/Title XII partnership in approaching these issues.

Conclusions and Recommendations

It is apparent that emphasis on the environment, natural resource conservation and sustainability represents a permanent direction for all aspects of international development. As such, new opportunities have emerged for involvement of U.S. universities through the Title XII partnership. The Task Force recommends that each of the strategies proposed in this report be addressed in follow-up action by BIFAD, USAID and the university community. In addition, the following specific recommendations are submitted to this Title XII partnership.

1. This appears to be the appropriate time to enlarge the Title XII mandate in order to permit a more comprehensive approach to environment and natural resource issues in agricultural development. This would include such areas as forestry, wildlife, aquaculture, ecology, multiple-use management of grazing lands and coastal areas and studies of the off-farm impacts of agricultural production practices.
2. The Task Force encourages USAID to incorporate environment and natural resource considerations into all agriculture and rural development projects, using the expertise of Title XII universities as appropriate.
3. The Collaborative Research model should be utilized in the design of new and more comprehensive approaches to environment and natural resource problems.
4. BIFAD should seek a commitment from USAID and the Congress for longer-term funding, with the objective of enabling universities to develop more effective multi-disciplinary approaches to sustainable agricultural production.
5. The university community should be challenged to aggressively support an increased flow of development assistance, with emphasis on environment and natural resources.
6. The Title XII community should develop more innovative approaches to collaboration with PVOs, environmental and natural resource groups, and the private sector.
7. More support must be provided for long term and continuous linkages between university and host-country institutions in areas of mutual interests.
8. The universities should continue to modify policies and programs to effectively contribute to sustainable agriculture both at home and abroad.
9. Increased attention should be given to the support of USAID's programs aimed at helping end hunger in Africa with greater emphasis on fragile environments and natural resources.
10. The Task Force encourages the university community, through the coordination mechanism of Title XII, to develop a strategy to become more involved with the other donors in international development -- particularly the World Bank and the regional development banks. The strong statements of policy made by these institutions toward environmental improvement cannot be implemented in the field without scientific backup -- most of this expertise could and should come from the universities. The Continuing Resolution passed by Congress in 1987 charging USAID with an environmental evaluation of all multi-lateral Development Bank loans may provide

an opportunity for more effective utilization of the U.S. universities on World Bank projects.

11. BIFAD should develop an agenda of follow-up activities to the work of this Task Force, including conferences or workshops to explore the issues, strategies, and research needs in more depth. These conference should involve a broader base of individuals and organizations, including PVOs and environmental groups to build consensus and support for approaches to these complex sustainability issues. Among the high priority topics for follow-up conferences should be:

- * A multi-disciplinary workshop to identify the most pressing regional problems of the fragile environments where collaborative research approaches would be effective.
- * A conference jointly planned with PVOs and environmental groups to explore ways to improve communication and collaboration on environment and natural resource issues.
- * A workshop focused on developing a longer-term approach to funding, program planning and project implementation.
- * A joint workshop involving World Bank leaders to explore opportunities for greater involvement of U.S. universities in the environmental evaluations of World Bank programs.

INTRODUCTION

There is growing awareness that environmental degradation is a major problem and that deterioration of the natural resource base threatens the sustainability of agricultural development.

The above quotation by the Board for International Food and Agricultural Development (BIFAD) served as the background for the creation of this special task force to address critical programs and policy issues relating to the environment and natural resources.

Environmental degradation is a major problem in developing countries and deterioration of the natural resource base threatens the long-term sustainability of agricultural systems on which much of the developing world's food supply depends. This calls for a re-evaluation of the approach to all agricultural projects by donor agencies, host country governments, and all universities involved in international development.

Nowhere is this re-examination proceeding more broadly than in the United States -- in Congress, among politically important private constituencies, in the university community, and in our principal American vehicle for official international economic assistance, the U. S. Agency for International Development (USAID).

BIFAD considers these concerns of utmost importance. The Board has long urged that the major emphasis in development assistance be placed on programs that emphasize the long-term outcomes that sustainable agriculture implies. BIFAD has charged this Task Force on the Environment and Natural Resources to:

1. Identify the key elements of strategy that must be implemented by USAID to achieve sustainable agriculture and environmental preservation in developing countries, with emphasis on Africa; and
2. Suggest how Title XII institutions can help implement these strategies by:
 - * viewing past Title XII contributions to sustaining or improving the environment and the wise use of natural resources in developing countries;
 - * identifying current and future opportunities for Title XII institutions to contribute to strengthening the capacity of developing countries to enhance their program relating to environment and sustain natural resource use;
 - * identifying most effective ways in which Title XII institutions and USAID can work together in this endeavor;

* identifying most effective ways Title XII institutions can contribute to the President's initiative to end hunger in Africa.

This report addresses each of these issues, some in more detail than others. While a number of recent reports have dealt with approaches to sustainable agriculture, this treatment differs in that the focus is on the role of U.S. colleges and universities and the unique opportunities and responsibilities afforded by the Title XII mandate.

The Task Force looks upon the concept of sustainability as a way of examining and evaluating all aspects of development to be certain that objectives are realistic and that results will meet the needs of this and future generations. Furthermore, we believe that BIFAD and USAID must consider the sustainability not only of cropping systems and the natural resources that sustain them narrowly, but also the sustainability of efforts in animal husbandry, fisheries and forestry, and other aspects of rural life. Finally, while this report focuses on natural resources and the environmental aspects of agricultural development, our Task Force recognizes that no less important to sustainability are the political, institutional, social, and particularly, the economic dimensions. These are concepts now shared by USAID and increasingly by other international agencies involved in agricultural development.

It is the purpose of this report to provide an overview of the key problems and obstacles to agricultural sustainability that have produced the current concerns; to identify overall strategies for dealing with these concerns; to discuss the particular contributions Title XII institutions have made; and to make some specific recommendations to BIFAD regarding its approach to environmental improvement and sustainable agriculture.

THE PROBLEM--AN OVERVIEW

The most serious problem facing agricultural development today is how to produce food, fiber, fuelwood and other forest products without harming the environment or the natural resource base. This challenge is greater in countries where population is rapidly increasing, poverty is prevalent, and per capita food production is decreasing.

Population Pressures

The high rates of population growth in the developing countries are exerting intolerable pressures on the environment and natural resources. The impact comes not only from increasing numbers per se, but from higher levels of income. Rising expect-

tations and the resulting efforts to provide a more satisfactory standard of living carry with them an even greater long-term environmental impact. More units of land, water, and energy are associated with each individual as per capita income rises. Also, with the development of more sophisticated food processing and transportation systems higher levels of pollution must be anticipated.

Food Production Remains Critical

While world-wide food production has risen dramatically in the past two decades there are still areas of wide-spread hunger and malnutrition in many developing countries. The situation in Africa remains very critical, since food production per capita continues to decline due to a combination of factors including frequent drought, high population growth rates, and resource depletion.

The Task Force also urges caution in the use of future projections of food production since there are no new technologies on the horizon comparable to those which resulted in the Green Revolution. Even in the developed world, increases in the rate of yield are slowing down while costs of production inputs continue to rise. Bio-technology holds great promise but most practical applications lie years ahead.

Limitations in the Resource Base

Some "under-developed" countries have already "over-developed" or over-exploited their limited resource base. A destructive cycle of cause-and-effect is being played out in these countries, exacerbating and accelerating degradation of the environment. As many studies have shown, the scenario may run like this: The limited arable land available for planting crops leads to further deforestation and shorter rotation periods for regrowth. The results are low crop yields, increased erosion, and less wood production. Fuelwood is replaced by animal dung which reduces the availability of organic fertilizer for crop production, which leads to decreased agricultural productivity, and eventually leads to the need for more cleared land. Such a cycle forces people onto more and more fragile land and complicates efforts to protect the environment and manage resources for sustainable yields.

Complexities of Environmental Issues

Understanding Ecosystems

Many of the ecological implications of agricultural development programs require more knowledge of complex ecosystems and a better understanding of the interactions among the physical,

biological and climatic components. The relationships between the productive capacity of the resource base and the increasing problems of water and air pollution, soil erosion and potential changes in micro- and macro-climate are not well understood. An attempt to correct a problem at one point in the system may lead to a more serious problem at another level.

In addition, many natural resource and environmental problems are not confined to country boundaries. Regional treatment of these problems are usually more difficult than dealing with traditional production problems within political entities.

Such major problems as desertification, deforestation, salinization, and loss in land productivity through soil erosion or overgrazing have begun to receive long overdue attention. But many more subtle changes taking place in the environment as a result of man's activity also have long-range impacts on our ability to sustain food production and economic development.

Examples of these less apparent problems are perturbations in ecosystems, gradual changes in biological populations, shifts in water and nutrient cycling, and potential climatic change. Also less understood are the possible trade-offs as decisions are made. For example, a corrective measure to reduce water pollution (such as flushing the soil profile) may actually increase the amount of water required to produce a ton of grain. A range conservation technique to sustain forage production may mean that more units of land are needed to produce a pound of beef. A decrease in the use of inorganic fertilizer may place more pressure on the limited arable land base by requiring more cultivated land per capita.

These examples are used only to emphasize the need for more research and understanding of the complex nature of natural and man-influenced ecosystems. Such knowledge is critical in determining priorities and successful outcomes of development assistance projects that have sustainable agriculture and the environment and natural resources in mind.

Continued Loss of Biological Diversity

Change in biological populations is an often overlooked concern. Overgrazing, forest removal, burning, and cultivation change the vegetation complex and affect other biological populations. Of direct concern to agriculture is the loss of genetic diversity for animal and crop production systems. This germ plasm may be essential to future improvement in agricultural performance.

In addition, there is increasing concern over the loss of endangered species important to natural ecosystems, and the continued diversion of a larger percentage of biomass for human use making less biomass available for other biological populations.

The loss of species diversity will change ecosystems and may endanger life support functions critical to mankind.

The impact of agricultural practices, particularly the use of agricultural chemicals and mono-culture, on the important balance between "desirable" and "undesirable" insect populations and the development of pesticide resistance lends another level of complexity to sustainability objectives. Implementation of integrated pest management (IPM) approaches are essential.

Off-Farm Sector Interactions

An adequate examination of the environmental dimensions of agricultural development must include the off-farm sectors such as farm supplies (particularly energy and chemicals); food processing and distribution; consumer trends and eating habits; as well as post-consumer waste management.

The many interactions between agriculture and associated industrial development are also important considerations in any environmental assessment.

A Pervasive Short-Term Perspective

The central dilemma facing those involved in agricultural development is how to meet today's needs while maintaining and improving tomorrow's prospects. The immediate, critical need for food, fuel and shelter in many developing countries is overwhelming the resource base on which their production depends. Worse, the ability to plan for the future may be paralyzed when people find the needs for today so great that thoughts for tomorrow have no meaning.

Some production practices designed for immediate increases in crop yields but which tolerate soil depletion or erosion will have serious consequences for long-term sustainability, and often for the poorest in the population. Decisions about land use or the selection of interventions to increase food production are caused not only by the pressures to meet today's needs for social reasons, but are often influenced by changes in personnel, pricing structures or government programs.

Inappropriate Agricultural Practices

Indiscriminate or non-selective production methods greatly decrease yields over time. Felling large areas of forest to log a few valuable hardwood species, or indiscriminately killing marine life while harvesting a few marketable fish, can rapidly destroy a productive resource base. Inefficient use of resources, (for example in the way fuel wood is burned or charcoal is made) can also increase demand for greater production and accelerate the pressure for deforestation.

In grassland areas where family income and security depend mostly on livestock, the number of grazing animals often exceeds the carrying capacity of the rangelands. Overgrazing results and soon the range is destroyed, desertification of large areas follows, and the people seek other areas for their livestock. Since most must move to areas that are already over-used, the cycle continues and more and more land for human habitation is destroyed.

Government Policies that Work Against Environmental Improvement

Government policies in developing countries are not always supportive of environmental protection and natural resources conservation. Many of them actually encourage unwise and unsustainable use of natural resources for the immediate need of feeding their people or to increase their export earnings.

Examples of the kind of policies that can be found in many developing countries which lead to environmental deterioration and natural resource degradation include:

- * unrealistically low prices for farm products, which in effect devalue the land, and subject it to abuse, neglect and consequent deterioration;
- * land and tree tenure policies that do not ensure continuity-of-use rights, and thus lead to abuse or neglect of soil, water, range and forest resources.
- * Communal landholding that often discourages long-term investments, such as tree planting or vegetation replacement.

CONCEPTS & DEFINITIONS

Environment

The many-faceted environment in which development occurs includes the physical, biological, economic and sociological conditions. While this broad concept is important to issues of sustainability, it is the ecological dimension that merits special attention in this report.

The ecological dimension is considered as the interaction among the biological and the physical and climatic components of the environment. Humans are considered as a part of the environmental complex. Humans have a greater ability than other biological populations to adjust to different environmental conditions. More importantly, humans have the capability, through technological innovations, to change the environment to suit

their specific needs. Inputs or interventions can either lead to environmental degradation or can be directed toward environmental improvement or reclamation. The choice of development options in addition to economic and social evaluations should always be subjected to very careful ecological analysis in order to prevent irreversible damage to the long-term capability of the environment to meet our basic human needs. The threat of environmental degradation increases as populations grow.

Natural Resources

The natural resources most critical in meeting food, fuel, fiber, and shelter requirements are plants, soil, water, air, vegetation including range and forests, energy and minerals. Climate can also be considered a resource since it influences the choices available for the effective use of other resources.

The classification of natural resources into two categories, (1) renewable and (2) non-renewable, has some utility for ecosystem analysis. However, these designations are not always clear cut. For example, water in the hydrologic cycle is a renewable resource over the long-term but, water in an underground aquifer may be a depletable resource in the short-term.

Sustainable Agriculture

In many developing parts of the world, traditional agricultural practices that have been followed for centuries are now buckling under poverty and population pressures that exert excessive demands upon the natural resource base. At the same time, modern, high-technology agricultural systems with their unparalleled productivity are being challenged by the high costs that energy and agri-chemicals can impose, not only on the economy but on the environment and natural resource base.

Clearly, sustainable agriculture is defined by its setting and is affected by an intricate networking of human and natural resources and all of the forces that operate on them to bring change. At its heart, sustainability requires access to knowledge that can be put to use when it is needed.

A number of groups and individuals (see references 5, 12, 16, and 33) have proposed helpful definitions for sustainable agriculture, such as a study which defines sustainable agriculture as "the successful management of resources for agriculture to satisfy changing human needs while maintaining or enhancing the natural resource base and avoiding environmental degradation." Another group states it as "the ability of an agricultural system to maintain production, over time, in the face of ecological difficulties and social and economic pressures." A third says sustainable agriculture "should conserve and protect

natural resources and allow for long-term economic growth by managing all exploited resources for sustainable yields."

In considering sustainable agricultural development from an environmental and natural resources view and against the background of USAID's programs, the Task Force agreed that sustainable agriculture is not a leave-it-to-nature system; or the attainment of a steady state; nor does it always aim specifically for minimum external inputs.

Important elements in the above concepts of sustainable agriculture are food security, a dynamic adaptability, a generation-to-generation time span, a concern for the environment and natural resource base, and varying levels of technology.

The Task Force also agreed that in determining whether a policy, program or project contributes to sustainable agriculture, the question to ask is: Does it meet evolving human needs for food, fiber and forest products and provide for a better life without damaging the natural resource base on which continuing productivity depends?

These concepts of sustainability raise some complex questions about agricultural development:

- * Will the incorporation of more long-term sustainability objectives into the development agenda lead to a loss in short-term food, fiber or wood production? If short-term productivity is reduced, what are the social, economic, and political consequences?
- * What are the trade-offs between food production which may tolerate some soil erosion, some water aquifer depletion, some loss of biological diversity and the alternative of complete environmental protection?
- * Can we develop technologies which reduce our dependence on depletable resources (such as petroleum and certain critical minerals) in the "less-developed" countries while the "developed" countries continue to rely on these same depletable resources?
- * What additional base-line data will be required and how will environmental change be quantified?
- * How can we identify and separate human-caused or human-accelerated environmental degradation from the natural geologic trends toward desertification or climatic change?

The scientific capability to research these, and many other questions about environmental change, is not presently within USAID. Therefore, the university community must join with the Agency in the search for viable alternatives.

TITLE XII: THE UNIVERSITY/USAID PARTNERSHIP

The landmark Title XII legislation has successfully involved the U.S. university community and USAID in an effective partnership for international agricultural development. In addition, the legislation has provided a mechanism for collaboration with the U.S. Department of Agriculture (USDA), other federal scientists, and many overseas scientists and government leaders. While the primary focus of Title XII has been on foods and nutrition as mandated by Congress, many aspects of natural resources conservation and environmental management have been considered an essential element in those programs. At the same time, the Task Force recognizes that there are limitations under the present authorization for Title XII that restrict the approach to many sustainability issues.

The U.S. university community, and especially those colleges and universities that have been designated as Title XII institutions, have enormous faculty resources, with competence to address a wide range of environmental and natural resource issues. These institutions have long been involved in institutional and human resource development. They have also conducted significant research and provided technical assistance in specific areas of science and technology, literally throughout the developing world.

Experiences with the Collaborative Research mode are contained in the appendix. This multi-disciplinary approach to research should be applicable to many of the regional environmental problems of the third world countries. This technique will involve scientists and commitments from U.S. universities, USAID, USDA and other federal agencies and the host countries.

A brief review of the Title XII experience, some lessons learned and some future opportunities are contained in Appendix A.

USAID PROGRAMS AND INITIATIVES

The Task Force was pleased to find that USAID policies and programs are increasingly sensitive to environmental preservation and sustained use of natural resources.

USAID has taken a leadership role in integrating environment and natural resource concerns into most development assistance efforts. Agency programs now address a range of environmentally related issues, and support research, technology transfer, training, and human and institutional resource development. All USAID programs have been subjected to environmental impact analysis since 1976 in accordance with a federal mandate.

The Task Force was also pleased to note that the Agency is encouraging the developing countries to also incorporate environmental concerns into planning processes for economic growth and development. An "environmental dialogue" represents an important addition to the long-standing policy dialogue with leaders of countries receiving U.S. aid.

An additional responsibility for environmental and natural resources was placed on USAID with the 1987 Continuing Resolution passed by Congress. The resolution charges the Agency to analyze the impacts of multi-lateral Development Bank loans on "environment, natural resources, public health and indigenous peoples" with recommendations to "mitigate adverse impacts."

Appendix B contains a more detailed description of some USAID programs and initiatives that are pertinent to the Task Force Report.

TOWARD ENDING HUNGER IN AFRICA

The huge continent of Africa, with about four times the land mass of the United States, probably presents the world's greatest challenge for sustainable agricultural development. While food production worldwide has been increasing, downward trends in per capita production continue in most African countries. This ominous threat of hunger and malnutrition is further complicated in the fragile environments where desert encroachment remains a major environmental concern.

During 1984 and 1985, public attention throughout much of the world was riveted on the plight of millions of Africans suffering under a severe drought. Drought is not unusual in Africa, so one may ask why this drought was so devastating. Civil war, inept government policies, and skyrocketing population growth all play a part in overwhelming the capacity of a developing country to provide for the needs of its people. But the crisis in African agriculture has been developing for many years. Per capita food production has fallen by nearly twenty percent since 1961, food imports have been increasing, and African economies have been staggering under the stress. Drought in these circumstances, which is a part of the environmental complex, can only mean famine.

Many studies have searched for the causes and cures for the famine problems in Africa. Most have concluded that:

- * Africa has the potential to feed itself if the potential can be mobilized.

- * Four important factors holding back the development of agriculture are inadequate incentives, lack of production inputs, inappropriate institutions and poor infra-structures.
- * Measures to correct the problems in African agriculture must operate within the general framework of sustainable growth.
- * The greatest single factor needed to create sustainable growth is conservation of Africa's environment and natural resources.

The Task Force concurs with the "Agro-ecological" approach to the analysis of sustainable food production options in Africa. Also greater attention to the fragile environments -- particularly the Sahelian/Sudanean zones is needed. Appendix C contains a review of some of the recent programs directed toward the alleviation of hunger in Africa and a brief analysis of some of the environmental and natural resource challenges facing the continent.

STRATEGIES FOR SUSTAINABILITY

There are several basic assumptions behind the strategies that are proposed by the Task Force for achieving agricultural sustainability. Among these are the recognition that USAID is only one among the many contributors to development assistance. With its limited resources, USAID should concentrate on the areas where it can make the greatest contributions. In the environmental arena, the USAID/Title XII partnership involving U.S. universities and other federal agencies has a comparative advantage.

While the U.S. record may not be ideal, this country has long been concerned about natural resource conservation, environmental improvement and the loss of biological diversity. Much U.S. agricultural research and technical assistance has been directed toward sustainable agricultural development, even though the term sustainability may be new to many sectors of the public.

The record of U.S. Soil Conservation Service in providing technical assistance to American farmers and ranchers for soil and water conservation practices has been a world-wide model since the shock of the Dust Bowl era in the 1930's. Sustained forest production, multi-use management and the wilderness concept have been a part of U.S. Forest Service programs for more than 50 years. The partnerships established between American universities and the U.S. federal agencies have been effective and should be utilized as we design strategies for environmental improvement and natural resource conservation in the many countries where USAID is providing development assistance.

The Task Force also recognizes and supports those USAID programs, such as family planning and rural health, which improve the human resources on which the sustainability of agricultural systems depends.

Many different strategies will be required to develop programs that have positive environmental outcomes and result in sustainable agriculture. The Task Force has chosen to address ten key strategies to which Title XII institutions can contribute effectively.

1. Developing a Long-Term Approach

Adding an environmental dimension to agricultural development programs will require a much longer time frame than has been traditional in the past. The Task Force considers this as basic to all other recommendations. The short-term perspective of development programs has long been a problem, especially in identifying and planning to avoid consequences that do not appear for several years. Many environmental and natural resource degradation problems are of this nature. A number of institutional factors within USAID and funding mechanisms in Congress encourage a short-term approach. The urgency to show results is also felt in countries where food and other necessities are in short supply.

Formulation of long-term sustainability goals cannot be attained with a two- to five-year project planning horizon. A minimum of ten years is recommended with rolling horizons for extensions. Elements of this long-term program strategy include:

- * Major changes in appropriations, budgeting and forward funding.
- * Compilation of comprehensive base-line data to describe the existing natural resource situation, the cultural setting and the points of environmental stress.
- * Formulation of a long-term strategies for agricultural development and natural resource protection into which individual programs or projects would be placed. The continuity of individual projects would be more likely if they were identified with long-term goals.
- * Evaluation of alternative approaches to the short-term need for immediate increases in food production as contrasted with the long-term potential decline in food production due to soil erosion or other aspects of resource deterioration.
- * Encouraging universities to develop multi-disciplinary teams which can provide continuity for assistance programs with expertise in the environmental sciences. The use of univer-

sity consortia or networking should be explored to provide USAID with resource personnel for environmental assessment.

2. Improving Measures of Progress for the Environmental Dimension

Developing adequate techniques to monitor the impact of agricultural or forestry programs on the environment may be one of the more difficult tasks for all development agencies. The most commonly used indicators of progress in agricultural development projects have been increased production and/or changes in income. While these economic measures are important, they are not adequate as indicators of sustainability, environmental degradation or resource conservation. Economists can contribute by placing an economic value on the resource base and assisting with the contrasting choices between individual short-run gains as opposed to (or complimenting) the longer-term contributions to society as a whole by proper conservation approaches.

The science of ecology can contribute substantially to the evaluation process -- particularly through the examination of ecosystems. The challenge however, is to involve all of the scientific disciplines in the development of environmental criteria as they provide professional input into the development process.

Elements of this strategy include:

- * Development of specific indicators for environmental sustainability;
- * Increasing research directed toward environmental criteria for measuring and monitoring effectiveness of projects;
- * Improvements in the data base to establish baseline conditions as a pre-requisite to the evaluation of added interventions; and
- * Broadening environmental impact assessments explicitly to include sustainable agriculture and natural resources protection.

3. Building Institutional and Human Resource Capacity

Institutions in most developing countries should be strengthened with more trained people to address environment and natural resource problems. Donor organizations such as USAID must produce strategies and programs for helping develop the human resource and the institutional base necessary to deal with the major problem areas at all levels, from government policies to specific practices used by farmers.

The major strength of Title XII universities is in their ability to conduct research and train people in a wide variety of disciplines required for addressing environment and natural resource issues. In building local institutions and human resource capacity, the following are important considerations:

- * Institutional development is best done incrementally--start with discrete, manageable objectives, and build onto successful small efforts;
- * Efforts by any U.S. or development institutions should be clearly focused, not spread too thinly across many sectors;
- * Site-specific capabilities in developing countries are critical in environmental and resource management programs -- the ability to analyze site-specific conditions and respond to them in a flexible manner.

4. Integrating Relevant Disciplines and Programs

Increased emphasis on sustainability will require better integration of the various disciplines in agricultural project planning and implementation. The ecological dimension should be emphasized. This may mean new team members trained in the environmental sciences or more careful selection of scientists from the many disciplines who have good ecological training or experience.

The problems of sustainable agricultural production do not fall neatly into disciplinary categories. The systems approach, using inter-disciplinary teams, continues to be applicable. In addition to the conservation of soil, water, plants and energy, an integrated approach to sustainability must examine distant watersheds, forests and grazing lands. As development evolves the projects may require the addition of new disciplines or expertise to address the indirect impacts of the agricultural programs.

The Task Force found a short-term fragmented approach still prevalent in both the central and regional bureaus of USAID despite efforts to correct this problem. It is the view of the Task Force that the artificial divisions that exist between agriculture and natural resource concerns in USAID should also be addressed.

Integration of effort poses challenges to U.S. institutions as well because of long-standing autonomies and practices at departmental and other administrative levels. The diverse talents in the forestry schools, departments of fisheries and wildlife, in faculties of range, soil, ecology and in the varied water program areas have had limited involvement through Title XII programs to date. Yet they have important capabilities in both project development and human and institutional development that

can improve the developing countries' capacity for formulating and implementing economic and social policies that integrate environment, natural resources, and sustainable agriculture issues.

Not only are tradition and bureaucracies hindrances to integration, but organization by subject matter also makes integration of the appropriate mix of people and skills difficult. Nonetheless, with clear incentives from USAID to do so, some universities will take the steps necessary to achieve integration. Many of the colleges and university departmental units already represent a mix of disciplinary talents with a focus on natural resource and environmental science and management, talents that have been honed on issues in these areas over the past 30 years. They are aware of the inter-relatedness of practices, resources and environments that are needed for long-term goals such as sustainability in development. And they are not unfamiliar with the need to seek ways to program for varied social and cultural conditions as well as economic circumstances.

5. Developing New and More Effective Technologies

Increased emphasis on the environmental dimension of agricultural development will require new technologies and approaches -- particularly for fragile environments. While the major increases in food production may continue to come from the better soils in the higher rainfall zones or with supplemental irrigation, the challenge of sustainability is more critical on marginal lands with low productivity. Green revolution technologies are not as useful on these lands and plant breeding is not a panacea. Rainfed crop production and livestock management deserve more attention. Technologies are needed that recognize soil and water limitations, biomass production and dissipation, the role of livestock and wildlife, the inter-relationships between crops, livestock and wood products, and other dimensions to sustainability.

Agricultural or timber development programs in the high rainfall tropical forests and slash and burn systems such as those common to the hills and highlands of Latin and South America are presenting new and different challenges for research to achieve the ultimate objective of sustainability.

The development of programs to meet sometimes conflicting objectives is no easy task and sorely challenges both the host country and the donors. Likewise, one must not assume that technology will be effective in areas where it has not been tested.

In selecting problems to be researched and specific elements to be examined it is important to avoid the trap of preconceived ideas. In efforts to control soil erosion, for example, one must recognize that erosion can be a natural process as well as a man-caused or man-accelerated phenomenon. Only the latter can be

significantly affected by improved management. It may not be possible or economically sound to try to develop technologies for complete control of geologic soil erosion. The concept of tolerable limits must be researched.

As another example, sustainability does not always mean low-input. Sustainable systems frequently require a relatively high input of scientific knowledge and management skills. In some areas systems of crop production with satisfactory yields cannot be accomplished in the foreseeable future without chemical fertilizer, even though this fertilizer may be derived from "depletable" resources. In parts of Africa, for example, where the soils are extremely infertile and organic sources of fertilizer are not sufficient, research has shown that cropping systems will likely include, at least for the short-run, external inputs of inorganic fertilizer. At the present time there are no "end perfect" technologies for some of these situations. This dilemma can only be solved with additional research.

For major new research initiatives on complex environmental issues, the Task Force strongly recommends a collaborative research approach similar to that used in the centrally-funded Collaborative Research Support Program (CRSP). This multidisciplinary approach offers the best opportunity to combine the scientific talent in the U.S. universities with a host country research team to define the constraints to sustained agricultural production and to evaluate alternative interventions.

The collaborative mode was designed to evaluate all contributing factors to complex agricultural systems including economic, social and environmental constraints. It can involve USDA or other appropriate federal agency scientists. It has been used by universities in a number of USAID-sponsored activities and has been effective in developing new technology, manpower training and lasting linkages. A more complete analysis of the collaborative model is presented under the discussion of Title XII. (See Appendix A.)

6. Improving Technology Transfer and Communications

This is a continuing need for greater utilization of the U.S. university community in solving the problems of applying new technology at the farm level. The sustainability emphasis makes the problem more difficult because there are more questions about economic viability and more problems with the evaluation of progress. The transfer of technology involving environmental quality is difficult because entire land-use patterns and management systems frequently must be modified -- a much more difficult task than convincing an individual farmer to adopt a practice that can increase his crop yields or income.

Some specific issues that must be addressed in a strategy for technology transfer for sustainable production systems include:

- * New and innovative strategies and procedures are needed. Title XII universities have diverse expertise in dynamic extension programs which involve human relations, communications, social issues, and public policy. This experience can be called on to assist with complex environmental problems.
- * The vast experience of the Soil Conservation Service in providing technical assistance for soil and water conservation practices should be examined as a part of the technology transfer challenge.
- * The training and involvement of developing country technical and extension personnel is the primary element in technology transfer programs.
- * Support for extension personnel with equipment and transportation is a continuing problem in most developing countries.
- * Avoid the top-down" approach. If the farmers and small holders are involved in the development and testing of new interventions, they will more readily adopt the practices.
- * Greater collaboration between Title XII institutions and Private Volunteer Organizations (PVOs) and non-governmental organizations (NGOs) at the local level is important. PVOs and NGOs are frequently very effective at the local level.
- * Do not assume that U.S. developed technology packages can be used directly by PVOs and NGOs at the local level.
- * Technology packages will be effective only if they are compatible with farmers needs and capacity.

7. Developing New and Improved Mechanisms for Collaboration and Linkages

For all programs emphasizing environmental improvement, the Task Force recommends that the Title XII community design a specific strategy to improve communications and collaboration with the large environmental groups. These organizations have a large constituency of concerned individuals who have an impact on appropriations and program direction. The central objective of sustainability should serve as a theme for joint seminars, workshops, and other means of collaboration.

A strategy is also needed to develop closer working relationships with PVOs, NGOs, and the private sector. The interna-

tional agricultural centers could also be more involved in sustainability issues, working more closely with U.S. universities.

8. Influencing Country Policies Toward Sustainability

While the Task Force recognizes that the influence of U.S. universities and USAID on host country policies is limited, we cannot over-emphasize the importance of these local policies to the issues of sustainability and environmental improvement.

The Task Force would like to encourage more research on policy alternatives by the U.S. universities. Likewise, research directed toward the impact of world-wide food production and trade on host countries with an evaluation of alternative strategies could help in host country policy development as related to environmental issues. Closer cooperation between the Title XII universities and the International Food Policy Research Institute (IFPRI) is encouraged. Title XII universities can assist in developing in-country analytical capabilities for policy research, a necessary condition for long-term improvements in government policies.

One of the key challenges for the developing countries is to establish policies which reward conservation efforts; policies which create an "incentive to conserve" as well as an "incentive to produce." Other areas needing attention are land-use planning, land settlement problems, restrictions on the cultivation of marginal lands, strategies to prevent overgrazing of range lands, policies on wood harvest and indiscriminate use of fire.

Credit systems and pricing policies have a major impact on decisions made at the farm level. The list of policy constraints to sustainability is long but the time for designing a better strategy to address these issues is becoming increasingly critical.

9. Removing Constraints to the U.S. Response

A. Constraints on the Agency for International Development

Funds available to USAID are inadequate for maintaining current programs and for major new initiatives concerning environment and natural resource management. Further reductions in appropriations appear likely. Redirection may be the only way to increase the emphasis on sustainability unless Congress can be convinced that more appropriations are necessary to address many of the pressing environmental issues -- issues which have an indirect impact on the developed world as well as those countries in the developing status.

Staffing within USAID continues to be a constraint for addressing sustainability problems. The number of direct-hire employees in USAID has continuously decreased in recent years. Decreases in technical personnel for addressing problems concerning environment and natural resource management and especially agriculture have been substantial. Inadequate trained staff in USAID also adversely impact the relationships of the Agency with U.S. university scientists.

While the Task Force is strongly recommending more attention to projects and programs relating to natural resource conservation and environmental improvement, we are concerned about the trend toward earmarking and set-asides. Much of this priority earmarking is imposed by pressures from Congress. This limits the flexibility of the Agency (both in funds and staff) to address the complex problems of sustainable agricultural production.

Another constraint within USAID relates to the structure and organization of the Agency. In the S&T Bureau the responsibility for agriculture resides in one organizational unit and Forestry & Natural Resources in another, creating artificial barriers to comprehensive approaches. Some regional bureaus and missions also have similar organizational barriers, hampering their progress. We recommend that USAID management consider ways of reducing these artificial barriers. The success of the Regional and Central Bureau programs must still be measured at the mission and farm level.

B. Constraints to U.S. University Involvement

Funding remains the primary constraint to increased participation by U.S. universities in international programs relating to the environment and natural resource conservation. Most states have severe restrictions on the use of state appropriations for international activities. Some states still do not manage their overhead funds in ways that stimulate international programs and projects.

While much progress has been made since the passage of the Title XII legislation in the development of appropriate policies to recognize faculty contributions to international programs, negative incentives remain at many universities. A commitment at the higher levels of administration and at the governing board levels is not evident in some institutions.

The impression that U.S. support for agricultural development is leading to increased competition for U.S. farm products has also had some impact on university international programs. The competition issue is certainly not valid for U.S. university participation in conservation and sustainability programs since environmental deterioration affects the entire human population and, likewise, solutions to environmental problems are mutually beneficial to both the developed and the developing worlds.

BIFAD in cooperation with the leadership of the Title XII institutions, should develop a strategy for removing these constraints and assist in its implementation.

10. Insuring an Adequate Flow of Development Assistance

Development assistance requires financial resources with continuity and duration if efforts are to succeed. At a time of U.S. fiscal constraint, the development assistance budget is coming under increased pressure. Money and trained people will be needed to solve the problems of resource deterioration and environmental degradation in the developing countries. Many of these complicated problems cannot be solved with the present levels of funding.

Recent decreases in USAID funds and personnel have curtailed some projects and reduced the duration and level of effort in others. This greatly diminishes the overall ability of USAID and its contractors, including Title XII universities, to accomplish program objectives. In addition, commitments and directives to use funds in special ways in the face of reduced resources greatly restricts new initiatives. This is all the more critical at a time when the Agency would, if funds were available, move more aggressively to address critical problems of environmental quality and natural resource use.

U.S. universities should assume a greater leadership role in promoting the importance of international development assistance to the general public. It is particularly critical that the American agricultural industry understand the value of increasing the income levels of the less developed countries where a great potential exists for increased trade. Several very good papers have been prepared on the topic since the American farm problem created a major concern about competition from foreign countries. Perhaps, more importantly, the general public must be convinced that environmental degradation affects the wealthy as well as the poor -- the developed as well as the developing countries.

USAID and Title XII universities must find ways to pool their resources, secure non-traditional support, and leverage other program support and the resources of other donors and host countries. Maximum cooperation is needed with PVOs, NGOs, the international agricultural research centers, programs of other donors, and potential linkages between and among neighboring developing countries. Networking must become the normal method of operation for programs that are aimed at positive impacts on the environment and natural resource use.

Key elements of a strategy to assure an adequate flow of development assistance include:

- * More aggressive efforts on the part of the university community to inform their constituency of the value of foreign economic development assistance and the critical importance of environmental problems; and
- * Improved cooperation and collaboration among universities and USAID with PVOs, NGOs, environmental groups, and others interested in budget and program support for sustainable agriculture.

CONCLUSIONS & RECOMMENDATIONS

It is apparent that emphasis on the environment, natural resource conservation and sustainability represents a permanent direction for all aspects of international development. As such, new opportunities have emerged for involvement of U.S. universities through the Title XII partnership. The Task Force recommends that each of the strategies proposed in this report be addressed in follow-up action by BIFAD, USAID and the university community. In addition, the following specific recommendations are submitted to this Title XII partnership.

1. This appears to be the appropriate time to enlarge the Title XII mandate in order to permit a more comprehensive approach to environment and natural resource issues in agricultural development. This would include such areas as forestry, wildlife, aquaculture, ecology, multiple-use management of grazing lands and coastal areas and studies of the off-farm impacts of agricultural production practices.
2. The Task Force encourages USAID to incorporate environment and natural resource considerations in all agriculture and rural development projects, using the expertise of Title XII universities as appropriate.
3. The Collaborative Research model should be utilized in the design of new and more comprehensive approaches to environment and natural resource problems.
4. BIFAD should seek a commitment from USAID and the Congress for longer-term funding, with the objective of enabling universities to develop more effective multi-disciplinary approaches to sustainable agricultural production.
5. The university community should be challenged to aggressively support an increased flow of development assistance, with emphasis on environment and natural resources.
6. The Title XII community should develop more innovative approaches to collaboration with PVOs, environmental and natural resource groups, and the private sector.

7. More support must be provided for long term and continuous linkages between university and host-country institutions in areas of mutual interests.
8. The universities should continue to modify policies and programs to effectively contribute to sustainable agriculture both at home and abroad.
9. Increased attention should be given to the support of USAID's programs aimed at helping end hunger in Africa with greater emphasis on fragile environments and natural resources.
10. The Task Force encourages the university community, in cooperation with BIFAD, to develop a strategy to become more involved with the other donors in international development -- particularly the World Bank and the regional development banks. The strong statements of policy made by these institutions toward environmental improvement cannot be implemented in the field without scientific backup--most of this expertise could and should come from the universities. The Continuing Resolution passed by Congress in 1987 charging USAID with an environmental evaluation of all multi-lateral Development Bank loans may provide an opportunity for more effective utilization of the U.S. universities on World Bank projects.
11. BIFAD should develop an agenda of follow-up activities to the work of this Task Force, including conferences or workshops to explore the issues, strategies, and research needs in more depth. These conference should involve a broader base of individuals and organizations, including PVOs and environmental groups to build consensus and support for approaches to these complex sustainability issues. High priority topics for follow-up conferences should include:
 1. A multi-disciplinary workshop to identify the most pressing regional problems of the fragile environments where collaborative research approaches would be effective.
 2. A conference jointly planned with PVOs and environmental groups to explore ways to improve communication and collaboration on environment and natural resource issues.
 3. A workshop focused on developing a longer-term approach to funding, program planning and project implementation.
 4. A joint workshop involving World Bank leaders to explore opportunities for greater involvement of U.S. universities in the environmental evaluations of World Bank programs.

APPENDIX A

THE TITLE XII EXPERIENCE

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The Title XII Amendment to the Foreign Assistance Act implemented in 1976 established a dynamic and effective partnership between the U.S. university community and USAID. In addition, the legislation provided a mechanism for collaboration with USDA, other federal scientists, and many foreign nationals. Although the focus of the legislation was on food production and freedom from hunger, it was recognized that natural resource conservation and sustainable agricultural systems were critical to accomplishing this objective over the long term.

More than ten years of experience with Title XII clearly shows that the legislation was sound and effective. BIFAD issued a summary report on some of these accomplishments and some future plans in the publication entitled "Toward a World Free From Hunger: An Agenda for the Second Decade of the Title XII Program." In this report BIFAD targeted six areas where collaborative efforts USAID and the U.S. universities can be more effective in the next decade:

- * Increasing agricultural expertise in the developing countries
- * Using U.S. agricultural professionals effectively
- * Expanding collaboration among and between universities and other institutions
- * Improving contractor selection processes
- * Improving project implementation performance
- * Increasing public understanding of agricultural development assistance

All of these objectives are appropriate as the Title XII community places greater emphasis on natural resource conservation and environmental improvement. Certainly, to move "Toward a World Free From Hunger" is not just a short-term objective but an important goal for future generations. Sustainability must be the ultimate test for all agricultural development programs.

While the primary focus of Title XII has been on foods and nutrition as mandated by Congress, many aspects of natural resources conservation and environmental management have been considered an essential element in those programs. At the same time, the Task Force recognizes that there are limitations under the present authorization for Title XII that restrict the approach to many sustainable issues. This section contains a

brief review of the lessons learned and strengths of Title XII programs.

The Unique Role of Title XII Institutions

The U.S. university community, and especially those colleges and universities that have been designated as Title XII institutions, have enormous faculty resources with competence to address a wide range of environmental and natural resource issues. These institutions have long been involved in institutional development. They have also provided technical assistance in specific areas of science and technology, literally throughout the developing world.

The special strengths of Title XII institutions are in human resource development, institution-building, and specific technical assistance. Universities provide education and training on campuses in the United States for participants from developing countries; they assist in the development of university-type institutions in developing countries; they provide a source of scientific expertise and basic research for the international research centers and other USAID projects; they add stability and coherence to USAID programs and projects over longer time frames; and they assist developing countries in their policy analysis.

The commitment of the Title XII institutions to international development is demonstrated by the fact that they have put their own financial as well as faculty resources into international programs. This is especially true for projects that complement specific institutional concerns. For example, Title XII universities in the southwestern United States have developed special expertise in programs in Central America. The University of Florida faculty has similar ties to tropical environments. Many other examples could be cited.

It is the opinion of the Task Force that USAID has not effectively used the wide array of university expertise for strengthening the environmental objectives of on-going development efforts. This involvement of university faculties will become more important in the design of new and more comprehensive research on complex environmental issues such as ecosystem analysis.

Most Title XII universities have Colleges of Agriculture, Forestry Schools, Departments of Geography, Sociology, Psychology and Anthropology, and many of them have developed special undergraduate and graduate programs in areas related to the environment and natural resource management.

Lessons Learned: Institution-Building

The results of Title XII programs have been variable. Activities directed toward the establishment of educational institutions and experiment stations have usually been successful. The training component of most projects has been outstanding and has left in place in-country scientists who will have a lasting impact on the future of their respective countries. Programs to institutionalize and develop extension organizations and programs have met with variable response.

Attempts to adapt the Land-Grant model to most third world countries have met with frustration. Most of these countries have separate ministries for research and extension whereas the teaching component remains with the university. Nevertheless, much progress has been made to improve cooperation and coordination among research, teaching, and technology transfer components necessary to agricultural progress.

USAID's Center for Development Information and Evaluation is now conducting a study of the agency's higher education experiences worldwide (28). They have completed field assessments of six agricultural colleges in Africa, all of which were former recipients of major USAID assistance efforts contracted through Title XII institutions. Similar field assessments are now being made in Asia and Latin America.

Worldwide the higher education institutional development efforts have been extensive. They involve nearly 40 institutions in 21 countries that have been developed with assistance by individual U.S. universities. However, these efforts face a number of obstacles in the agricultural area, such as: lack of broad-based farmer support, lack of small-holder input into research and extension functions; competitive ministries; emphasis on teaching in most of the new schools to the near exclusion of research; and institutional rigidities due to colonial behavioral legacies.

Development assistance to agricultural higher education institutions show substantial increases in numbers of students admitted and graduated. Thus, the production of manpower, primarily at the undergraduate level, has had a major impact on the host country. In most cases these graduates have been employed in the public sector, where they now fill middle- and senior-level positions in government agencies involved in agricultural research, extension, teaching, and administration.

The rapid growth in student enrollments has been paralleled by a rapid growth in quality and numbers of faculty. Many of the institutions assisted by Title XII relationships now have a solid core of Ph.D. agricultural scientists. However, most have limited support for their research -- essential in keeping scientists current in their technical fields.

Integration of research and extension responsibilities varies worldwide. In India, extension and research activities have been successfully incorporated into the academic structure. The Indian institutions also developed M.S. and Ph.D. graduate programs that reflect their commitment to research. They can and do address issues affecting environment and agricultural sustainability.

The most critical element for project success is the degree and nature of the U.S. university's commitment to institution-building projects. Such successful undertakings depend heavily on strong university leadership, where presidents and deans commit their institutions and faculty to problem-solving projects in developing countries.

A recent study by BIFAD reported experiences of 60 American agriculturalists from nine U.S. universities who participated in AID-funded institution-building contracts with 14 African colleges of agriculture (21). The study found the greatest amount of dissatisfaction centered on achievement of research and extension objectives. The specialists thought that the African colleges of agriculture should be more directly involved in the applied research necessary to develop and disseminate improved technologies for production and for agricultural stability.

Most of the participants in the study also believed that the Title XII institutions have an important and challenging role in working with their counterpart institutions in Africa. They noted five constraints that affect Title XII institutions' ability to respond effectively to new institution-building contract opportunities, especially in Africa:

- * An increasing gap between cutting-edge U.S. agricultural technology and that required for African resource conditions;
- * Increasing control of the U.S. faculty work agenda by narrow disciplinary interests;
- * Incentive structures inappropriate to encouraging work on multi-disciplinary problem-solving projects;
- * Diminishing control by U.S. university leadership in making major institutional commitments to applied work; and
- * Weaker individual and national economic conditions resulting in reduced political support in states.

To obtain the essential campus support for future effective involvement by U.S. university personnel, it is necessary that the USAID commitment be clear and long-term. In addition, structural adjustments are needed in university procedures to promote the creation of viable career paths for those faculty and staff making commitments to international development work.

Lessons Learned: Agricultural Research and Technology Development

Title XII institutions have been key instruments for implementation of USAID research assistance activities for more than 30 years. USAID assistance to regional and national research institutions through Title XII institutions has been highly successful in training researchers and in establishing or expanding research facilities. However the effectiveness of research activities, including those related to sustainable agriculture, have often been hampered by managerial insufficiencies and by unfavorable government policies, as well as by an inadequate awareness of conditions on the small farms.

In a recent USAID review of research, 48 USAID-funded agricultural projects were analyzed (23). Thirty-nine of these projects had been underway for only five to seven years. Many of the projects were designed to help solve specific problems at the farm level. Frequently, the institutional base was not adequate to exploit the results of the research. Successful agricultural research requires a stable institutional base as does education and technology transfer. A basic commitment to the development of institutions capable of addressing the agricultural, environmental and social issues by the individual developing countries where USAID is working is essential for successfully addressing environment and sustainable agricultural issues. The USAID study reports the following important lessons learned:

- * Many operational problems are involved in doing on-farm, farming-systems-type research that includes farmers in the research process.
- * In the project-oriented mode, there are issues of research quality and research priority that must be resolved.
- * A project with a finite life has many phasing-of-activity issues, especially construction delays, which impede planned research as well as affect the amount of time allowed to achieve the research objectives.
- * AID's supervision of research projects is frequently inadequate due to lack of technical expertise and frequency of staff turnover in the missions.
- * Institutional weaknesses in extension and linkages to complementary services (such as inputs, credit, marketing) hamper research.
- * Host-government support for the projects is frequently inadequate.
- * Lack of qualified personnel to work with expatriate technicians and low salaries for host-country researchers make

it difficult to maintain competent staff for effective research.

- * Participant training programs do not provide sufficient trained personnel to carry on research.
- * Delays in procurement of essential supplies and equipment frequently delay research results.
- * The delay or inability of USAID and its contractors to provide qualified technical assistance on a timely basis also hampers research progress.

The issues stated above indicate that most agricultural research activities in developing countries have not really focused on the institutionalization of research in the host country. This means that project development generally has not capitalized on what the Title XII institutions can do best. The project process tends to individualize activities to such an extent that the broad institutional interests and capabilities of Title XII universities are not fully utilized.

Centrally-funded research activities experience a different set of constraints. These include linkages with mission programs and host-country institutions, staffing to supervise contractors and insure performance, limited scope and inadequate funding for projects. The centrally-funded Collaborative Research Support Programs (CRSPs) as discussed later, have the potential to minimize many of these problems.

Some other centrally-funded projects, largely carried out by Title XII universities, that contribute to sustainable food production are:

- * The Water Management Synthesis II -- irrigation sustainability
- * The Consortium for Pest and Environmental Control-- pesticide safety
- * The Seed Technology Project under Mississippi State University
- * The Fragile Lands Project -- technology for steep lands
- * The Farming Systems Project at the University of Florida
- * Land Tenure Projects
- * The Agriculture Marketing Project at Michigan State University

- * The Aquaculture Project at Western North Carolina and Auburn Universities developing new knowledge and procedures for effective cooperation between universities and PVOs.

Lessons Learned: Extension and Technology Transfer

The rapid transfer of new technologies to the farm level is a critical component for increasing food availability and raising the incomes of small farmers in the developing countries. However, the task has not been easy. USAID initiated a recent review of 50 projects whose principal components were agricultural technology dissemination. 1 The projects were categorized as to whether they supported a public or a private sector approach to extension (the private sector including private voluntary organizations) to distinguish between the results of non-traditional approaches and the U.S. land-grant approach.

Regardless of the approach used, the following problems beset almost all of the technology transfer efforts:

- * There is often a lack of appropriate technology to extend.
- * There are usually poor linkages between research and extension. The linkages are a strength of the U.S. land-grant system, but they do not exist in most institutions in other parts of the world.
- * Constraints on host countries' fulfillment of their agreements, including difficulties in assignment of counterparts and in providing adequate operating expenses for transport and equipment needs, continue to be a problem.
- * Projects are frequently overly complex and ambitious. Many have research, training, input supply, information dissemination, credit and marketing components. Some were implemented by several agencies, various donors and some even by several contractors.
- * In order for Title XII institutions to allocate their best institutional resources, a longer than normal planning and funding horizon is needed for USAID projects.
- * Short-term planning and funding horizons do not contribute to the infra-structural changes that are necessary for host countries to develop the capability to assume responsibility for technology transfer activities.
- * Proposed technologies sometimes lack adequate economic analysis or evaluation as to the social acceptability within the culture.

1. Unpublished material from PFC/AID.

The Collaborative Mode

Early in 1974, a joint study by USAID and U.S. universities concluded that university involvement in international development activities sponsored by USAID could be increased with positive results. The study also concluded that universities should participate directly in designing the projects they were called upon to implement and that such projects should be longer-term with extended supportive, follow-up relationships between the cooperating U.S. and host-country institutions.

Subsequently USAID worked with U.S. university representatives to develop a new contracting approach, and a new instrument, for long-term university projects involving collaboration with developing country institutions. Out of this effort emerged the "collaborative assistance mode" of university contracting.

Involvement of U.S. universities, USDA, and other scientists in the planning as well as the implementation of projects has many advantages for both the host country and the universities. It also simplifies USAID's project management.

University experience with projects using the collaborative assistance mode has generally been very positive. The Task Force believes that USAID should return to the use of this mode for implementing new projects relating to complex "sustainability" issues.

The Collaborative Research Support Program (CRSP) is one example of collaborative assistance. Scientists from U.S. and developing countries collaborate to solve natural resource management and agricultural production problems of mutual interest.

Nine CRSPs have been implemented since 1977. The CRSPs on soil management and on stock assessment address natural resource management issues exclusively. The commodity and small ruminant CRSPs have evaluated many production practices that are considered environmentally sound and can lead to sustainable production.

The CRSPs were designed to establish long-term linkages between specific national research programs in developing countries and the majority of the U.S. expertise in each commodity area. Each CRSP was planned not only to produce research benefits, using the best scientists and technologies available in the United States, but also to benefit human resource and institutional development.

In 1986, USAID conducted a comprehensive review of the CRSP and reported on the performance of four programs (26). That review concluded that the programs were satisfactory overall and were:

- * Effective in causing the U.S. universities and associated organizations to provide the best individual and institutional talent available in the United States to work on the selected research topics;
- * Producing useful research results;
- * Effective in training counterpart personnel for collaboration in the host country national research program;
- * Able to mobilize funds from various sources to support partially the equipment and operational costs for the collaborative researchers;
- * Effective in providing a linkage for newly trained scientists upon return to their countries; and
- * Facilitating maintenance of professional contact between developing country scientists and their U.S. counterparts.

The review also identified several difficulties in CRSP implementation, most of which relate to inadequate funding and short-term horizons.

The CRSP model has generated matching support from U.S. universities as well as stimulated host countries to provide both in-kind and direct financial support to the program.

The training components have been highly successful, and will have lasting impact on both the host country and U.S. institutions.

The CRSP is one of the few approaches to development assistance that has attracted new young U.S. scientists and graduate students to the international development arena. The scientists and collaborators have made substantial contributions to the literature across a wide range of disciplines.

The Task Force believes the collaborative mode should be used to the maximum extent feasible, especially for programs concerning the environment and natural resources management for sustainable agriculture.

Sustainability: Challenge and Opportunity for Title XII

The Task Force is convinced that emphasis on the environment, natural resource conservation and sustainability represents a permanent and long-overdue direction for all aspects of international development. As such, new opportunities for involvement have emerged for the U.S. universities through the Title XII partnership. Those opportunities can be developed through a broader interpretation or change in the Title XII mandate.

As more emphasis is placed on environmental improvement and resource conservation, it becomes apparent that deficiencies exist in our knowledge base. Some of the areas where additional research is needed include:

- * Regional studies of ecosystems, watersheds, and other environmental problems that transcend country boundaries;
- * Energy flow and biomass distribution in agricultural ecosystems;
- * Efficient use of water for croplands, rangelands, and agroforestry systems;
- * Underground aquifer depletion and potentials for recharge;
- * Approaches to soil fertility problems and nutrient deficiencies;
- * Sustainable systems for use of the "common" lands;
- * Policy research directed toward farm-level decision making and economic incentives for conservation;
- * Economic analysis of the private and social costs and benefits of alternative conservation technologies;
- * Impact of deforestation and brush removal -- vegetation and reforestation options;
- * Role of livestock in vegetation change and biological diversity;
- * Early warning systems to reduce drought risk, vegetation damage, and insure food security;
- * Integrated Pest Management and techniques to reduce adverse impacts of agricultural chemicals;
- * Techniques to reduce water and air pollution;
- * Evaluation of change in micro- or macro-climate;
- * Improved techniques for project evaluation.

APPENDIX B

USAID INITIATIVES TOWARD SUSTAINABLE AGRICULTURE

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Programs and initiatives of USAID are becoming increasingly sensitive to natural resource conservation and environmental concerns. Agency programs now address a range of environmentally related issues, and support research, technology transfer, training, and human and institutional resource development. All USAID programs have been subjected to environmental impact analysis since 1976 in accordance with federal mandate.

The Task Force was also pleased to note that the Agency is encouraging the developing countries themselves to incorporate environmental concerns into planning processes for economic growth and development. An "environmental dialogue" represents an important addition to the long-standing policy dialogue with leaders of countries receiving U.S. aid.

USAID's program that impacts most heavily on environment and natural resource concerns is funded under Section 103, Agriculture, Rural Development and Nutrition (ARDN).

The ARDN programs focus on increasing the incomes of the poor majority and on expanding the availability and consumption of food while maintaining and enhancing the natural resource base. Although the primary objectives of these programs are income-oriented, support is provided for agricultural systems that are productive, sustainable and environmentally sound.

This strategy acknowledges the relentlessly increasing pressure on the world's fragile land resources. Programs and farming systems that help conserve the natural resource base, protect the environment, and preserve genetic diversity also help maintain the long-run capacity of nations and small farms alike to produce the food required for the future.

The Office of Forestry, Environment, and Natural Resources (FENR) in S&T carries out programs that give high priority to the development of integrated natural resource management programs: Soil conservation and watershed management; forest management and reforestation; resource inventories; land-use planning; pollution control; coastal zone management; development of data for resource use planning; and maintenance of biological diversity (increasing emphasis in line with new legislation).

Some projects are concerned solely with providing natural resource information, technical or policy assistance to address critical environmental problems or training of developing country personnel in natural resource management. In other cases, country environmental profiles or similar studies are used for policy dialogue and institution-building.

An additional responsibility is placed on USAID by Section 537(h) of the Continuing Resolution passed by Congress, December 21, 1987. This resolution charges the administrator of USAID, in consultation with the secretaries of Treasury and State to:

- * analyze the impacts of multi-lateral development bank loans . . . on "environment, natural resources, public health, and indigenous peoples" with recommendations to "mitigate adverse impacts."
- * compile a list of proposed multi-lateral development bank loans "likely to have adverse impacts on the environment, natural resources. . ."
- * ". . . prepare a report on a comprehensive strategy for maximizing the use of foreign assistance provided by the United States through multi-lateral and bi-lateral development agencies to address natural resource problems, such as desertification, tropical deforestation, the loss of wetlands, soil conservation, preservation of wildlife and biological diversity, estuaries and fisheries, croplands and grasslands."

The American university community, through Title XII or other mechanisms, should assist USAID with this rather all-encompassing challenge. It is obvious that "sustainability" is not just a fashion, but a continuing new direction for development assistance.

The Task Force is concerned about apparent constraints to development and implementation of comprehensive environment and natural resource programs:

- 1) Responsibility for these programs and projects rests with several organizational units in some Bureaus. This results in a lack of program focus on big problems and leads to program voids and some duplication of effort.
- 2) Constraints of limited qualified personnel, insufficient funds for comprehensive programs, and dedication of funds to special and on-going activities leaves limited resources for new initiatives in environmental preservation and natural resource management.

In spite of these serious constraints, each Bureau and Mission is responding to the growing concerns about environmental quality as articulated by numerous studies and reports. In 1985 USAID issued a Task Force report on "U.S. Strategy on Conservation of Biological Diversity," and a report in 1987 came out under the title, "The Transition to Sustainable Agriculture: An Agenda for AID."

Bureaus and Missions have growing portfolios of activities aimed at addressing environment, natural resource and sustainable

agriculture issues. Areas of concentration include, among others, forestry (including natural forest management, reforestation, multipurpose trees and agro-forestry), soil management and conservation, water management, resource inventories, land-use planning, water and waste-water treatment, pollution control, coastal resource management, and maintenance of biological diversity. Because of regional and national differences, each Bureau's program is specific for the area of concern.

In the Fall of 1987, USAID summarized its commitment to environmental improvement in a Special Report entitled "The Environment: Managing Natural Resources for Sustainable Development." (32) The Task Force commends these effort and encourages follow-up action at the field level.

APPENDIX C

COOPERATION WITH USDA AND OTHER FEDERAL AGENCIES

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Since the initiation of Title XII in 1976, USDA and the National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce have been important partners in international agricultural programs. USDA and NOAA maintain a liaison with BIFAD and its key committee. In addition, USDA and NOAA scientists and extension personnel have worked with U.S. universities and USAID in research, extension and technical assistance activities in many developing countries.

Under USAID and World Bank funded programs, the Soil Conservation Service and the Forest Service have been involved for several years in international projects and activities directly related to protecting and enhancing the natural resource base and the environment. The following examples were called to the attention of the Task Force:

- * Forestry Support Programs - several countries;
- * ASIAN - Water Management;
- * Indonesian-Upland Agriculture and Conservation;
- * Gambia - Soil and Water Management;
- * Burundi - Forestry;
- * Dominican Republic - Natural Resources Management;
- * Honduras - Natural Resources Development;
- * Peru - Soil Conservation;
- * Ecuador - Forestry;
- * Mexico - Forestry and Soil Conservation.

NOAA provides important support in agriculture and fisheries and the Sea Grant Program assists Title XII universities to maintain a strong base of research.

As more attention is directed toward natural resource conservation and the environment, the Task Force encourages increased use of the expertise available in the USDA, NOAA and other federal agencies.

APPENDIX D

AFRICA: THE DILEMMA OF HUNGER AND SUSTAINABILITY

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AFRICA: THE DILEMMA OF HUNGER AND SUSTAINABILITY

Nothing is simple about Africa, least of all the dilemma of how to go about ending hunger without further damage to the natural resource base.

The continent is politically complex. Forty-three countries south of the Sahara achieved independence between 1956 and 1980. Many have seen more than one military coup or major political change in their search for self-determination.

Africa is a huge continent, spanning seven time zones, roughly four times the land mass of the U.S., and made up of many agro-ecological zones, each with its own set of food production needs and constraints.

Rapid population growth and low per capita incomes continue to cast ominous shadows across all approaches to improving agricultural production and food availability.

During 1984 and 1985, public attention throughout much of the world was riveted on the plight of millions of Africans suffering under a severe drought. Drought is not unusual in Africa, so one may ask why this drought was so devastating. Civil war, inept government policies, skyrocketing population growth all play a part in overwhelming the capacity of a developing country to provide for the needs of its people. But the crisis in African agriculture has been developing for many years. Per capita food production has fallen by nearly twenty percent since 1961, food imports have been increasing, and African economies have been staggering under the stress. Drought in these circumstances, can lead to famine.

Many studies have searched for the causes and cures for the famine problems in Africa. Most have concluded that:

- * Africa has the potential to feed itself if the potential can be mobilized.
- * Five important factors holding back the development of agriculture are inadequate incentives, lack of production inputs, inappropriate institutions, poor infrastructures and lack of socially acceptable, economically sound farm level technologies.
- * Measures to correct the problems in African agriculture must operate within the general framework of sustainable growth.
- * The greatest single factor needed to create sustainable growth is conservation of Africa's environment and natural resources.

In September 1986, the President launched an Initiative to End Hunger in Africa through economic growth and private enterprise, and established a government-wide Coordinating Committee for sub-Saharan Africa. The Administrator of USAID chairs this committee. A task force report sponsored by this coordinating committee called for the following actions:

- * Increased donor coordination
- * Establishment of a development fund for Africa
- * Addressing debt problems multi-laterally
- * Addressing debt on a bilateral basis
- * Multi-year commitments for food aid
- * Increasing private trade and investment
- * Improving administration and coordination
- * Increasing private sector involvement

While environmental improvement was not highlighted as a major call for action by this report, natural resource deterioration was cited as a serious problem.

In response to the President's initiative, USAID is working to develop coherent and effective programs for development in Africa. The African Development Fund has been an essential resource for these activities.

The economies of most African nations depend heavily on agriculture; sustainable agriculture depends on a stable environment and natural resources. Much of USAID's new development initiatives in Africa, therefore, are related to environment and natural resource concerns.

The Bureau for Africa in the Agency has developed a series of documents and plans for accelerating development efforts on the continent. Two of the major documents are described briefly because of the focus on environmental issues.

Plan for Supporting Natural Resources Management in Sub-Saharan Africa, 1986.

This plan recognizes that natural resource management activities can and should be a more important component of the overall African development strategy and programs of the Agency. This document outlines the major agro-ecological zones of Africa and lists the following broad principles that will structure USAID programs in environment and natural resource management:

* Concentration -- The United States will concentrate on natural resource management, especially soils and vegetative management, water management, and biological diversity. Emphasis will also be given to developing and extending technologies and the training of Africans.

* Integration -- Natural resource management will be integrated into broader-based policy dialogue and agricultural and rural development programs where feasible and appropriate.

* Long-Term Commitment -- Recognizing that natural resource programs require many years, USAID will make every effort to develop long-term host country strategies to serve as a coherent framework within which short-term assistance can be applied effectively and to seek multi-year assistance agreements where feasible.

* Donor Cooperation and Coordination -- USAID provides only about 15 to 20 percent of the total donor assistance for Africa, so it is important that other donors be mobilized to address large-scale problems. Hence, a priority for USAID will be to work with Africans to establish sound national strategies and plans for use in coordinating assistance.

* Local Involvement -- USAID recognizes that to be successful any program concerning natural resource management must be technically sound and socially acceptable. Thus its programs will be aimed at assisting the natural resource manager at the local level.

Plan for Supporting Agricultural Research and Faculties of Agriculture in Africa, 1985

This plan calls for USAID to make major efforts to develop research capacity in specific countries and research networks throughout sub-Saharan Africa. The plan also establishes a framework for development of strong faculties of agriculture in selected African countries to train African scientists and conduct research.

These two reports constitute only a small part of the literature on the hunger problem and environmental concerns in Africa. It is beyond the scope of this Task Force's time or responsibility to present a complete review of the literature on the African situation. Individual members of the team have vast experience and scientific knowledge about aspects of agricultural production and corresponding environmental problems in Africa which could not, because of time and space, be incorporated in this brief report. It is, however, appropriate for the Task Force to emphasize several major points:

- * Many of the desperate attempts of the poor people of Africa to provide their basic needs for food, fuel and shelter are leading to resource deterioration and loss of biological diversity. Unless conservation measures are adopted and sustainable systems developed there will be serious adverse impacts on future generations.
- * Approaches to the short-term solutions must be designed with the longer-term goals of sustainability as the ultimate objective.
- * The problems are complex, many transcending country boundaries. The Task Force concurs with the agro-ecological zone approach to many of the sustainable agricultural production problems of Africa. However, we also recognize that some regional environmental issues (such as river systems and underground aquifers) are not confined to ecological zones. The collaborative research mode appears to be appropriate for the study and analysis of alternative strategies for these regional problems.
- * More research is needed to measure the environmental impact of agricultural development, to evaluate trade-offs, and to examine alternative solutions. In sub-Saharan Africa, for example, more emphasis should be placed on techniques for water conservation and soil fertility deficiencies. The problems of livestock overgrazing and the cultivation of marginal lands must be solved.
- * More research is needed to answer the question: How much of the desertification process is man-caused and how much is associated with geologic trends or long-term climatic change?
- * The U.S. universities can and should be enlisted, through Title XII mechanisms, to assist with environmental improvement and natural resource conservation programs in Africa.

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