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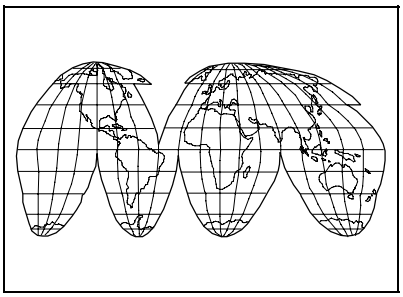

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R&RS*Research and Reference Services Project***R&RS**

SUSTAINABILITY IN AGRICULTURE AND NATURAL RESOURCE MANAGEMENT

by Diane Russell,
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SUSTAINING THE VISION:

Lessons for USAID's Move Toward Sustainability and Sustainable Development
A Series of Issue Papers
by
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OVERVIEW OF THE SERIES

> "We humans have a kind of tunnel vision. We only see what we can use. We have not been able to see until recently that it's useful to maintain the integrity of the organism." -- Howard Rheingold

Prepared by Diane Russell, Research Manager, Research and Reference Services Project

This series of issue papers was prepared as a complement to the U.S. Agency for International Development (USAID) strategy papers and the strategy implementation guidelines to assist USAID's move toward sustainable development. It provides decisionmakers with information on definitions, concepts and lessons learned in sustainability and sustainable development from inside and outside USAID, and examines how these concepts are applied within different sectors. The reader will find that, in this series, there are different types and levels of analysis applied to different sectors. This variation reflects the materials available and used, the nature of the sectoral issues, and the viewpoints and experiences of the authors.

The series is meant to stimulate dialogue within the Agency that will lead to sharing resources and experience. Given the complexity of the topic and vastness of the information resources, however, the papers cannot present a definitive treatment of each subject. In addition, they do not express the views of the Agency nor has it surveyed, in a comprehensive way, attitudes and level of knowledge about sustainability within USAID.

The research has involved reviewing USAID and non-USAID literature, analyzing project information from the Development Information System (DIS), working with individuals from the former International Development Management Center (IDMC) and the IRIS (Institutional Reform and the Informal Sector) Project to get a sense of the history and scope of sustainability within USAID, and interviewing informants within and outside the Agency.

The series begins with Jim Esselman's paper on sustainability and health. As there was an extensive history of USAID experience in relation to sustainability in this sector, the paper concentrates mainly on the Agency experience. The final section of the paper brings up some key issues in relation to health projects and sustainable development.

The second paper, by Dana Wichterman, on economic growth and sustainability, presents both USAID and other donor experience in designing and implementing sustainable economic growth projects, highlighting the difficulty in finding consistent definitions and sustainability materials in this diverse sector. This paper also presents recent discussions on economic growth and sustainable development.

Democracy projects, democracy, and sustainability are addressed in the third paper, in which Heather McHugh looks at these issues through various lenses, and as critical elements of sustainable development. As a relatively new concern for USAID, democracy and governance activities are being defined and fleshed out, and recent lessons are presented.

"Green" environmental issues relating to agriculture and natural resource management, discussed in Diane Russell's paper, have the most robust theoretical literature relating to sustainability and sustainable development, but USAID lessons are relatively new. This fourth paper thus applies the most recent lessons and models to the elaboration of the strategies for sustainable development.

The final paper draws from these works and others to show how these lessons, models and debates can be used by USAID decision makers in the strategic and analytic process of sustainable development.

A Vision

Sustainable development involves decisions about what benefits need to be sustained over what time frames with what resources. As change is unpredictable and hard to understand even in our own society, development planning theory shifts toward integrative/multilevel analysis of patterns of change, and away from modernization models that limit thinking to one trajectory of change or one mode of problem solving. As sustainable development integrates beneficiaries into the planning process, decision and action become more flexible and mobile.

Definitions

Sustainability is:

- a **measure** of how the growth, maintenance, or degradation of a resource or set of resources affects a population's ability to sustain itself. **Indicators** are used to measure these effects. A resource can be natural or human, and includes knowledge, technical, financial and other social systems.

- a **property** of processes, investments, technologies and systems as they affect resources available to a population over time. Processes such as policy reform, investments made by donors, governments or other groups, technologies such as improved crop varieties, and systems such as a land tenure or judicial systems have an **impact** on access to, valuation and sustainable use of resources. The extent of local participation in and ownership of a process, investment decision, technology development and system is seen to be crucial to sustainability.

- fluid and ever-changing: there are **tradeoffs and substitutions** among resources and systems as valuation and access change over time. Nevertheless, many theorists of sustainable development argue that natural resources are, ultimately, finite and that certain processes, investments, technologies or systems can quicken or slow the pace of resource depletion.

In its broadest interpretation, **environmental** sustainability refers to the measurement of change in the resource base that supports existing populations. The renewal capacities of natural resources are determined by growth and development cycles, which can be altered through technology innovations. Development investments for a given population must calculate the rates of resource degradation and regeneration, and costs and benefits of different technology packages, in relation to the resources needed and available. An example of a key resource to be sustained is soil fertility, which can be sustained by combinations of fallowing land (land intensive), technology infusions (capital intensive), or the adoption of sustainable agroecological systems (labor intensive).

Economic sustainability is the ability of a population to generate revenue to maintain itself in a market economy and produce a surplus to invest in security, research and development, infrastructure, and social safety nets. At the local level, it is the ability to maintain food and income security so as not to deplete the resource base and drive away young people. Balancing investments in government and community level activity, public and private sectors, and gauging growth potential in relation to environmental and equity concerns, is part of the sustainable development process.

Resources are valued and used within the human framework of ideas and social structures. **Social** sustainability relates to the soundness, richness and flexibility of organizations and institutions that govern access to and transmission of resources. Supporting institutional sustainability does not mean sustaining specific institutions or organizations, however, but helping people to build and strengthen frameworks -- legislative, regulatory and financial -- that allow sound institutions to flourish. Sound institutions enable societies to use and allocate resources in a transparent and efficient manner.

Benefit Sustainability

Within the development community, sustainability refers to the ability of benefit flows to be maintained after project funding ceases. It is important to note that benefit sustainability does *not* imply that the project itself continue. In fact, benefits are usually best sustained by beneficiaries themselves through NGOs, governments, or community groups, after the initial USAID investment. Donors may need to sustain benefits over a longer time frame, however, to reach particularly disadvantaged, marginalized or poorly organized beneficiary populations. The calculation of benefit sustainability -- what needs to be sustained over what time frame -- is discussed in Paper 5 in this series.

A great deal of attention has focused on benefit sustainability over the years and much is known about how to accomplish it, but there has been limited success in refocusing and redesigning for sustainability.

Financial Sustainability

Financial sustainability is a component of benefit sustainability that addresses issues of management capability for eventual self-financing for development investments. Financial and benefit sustainability are components of planning for sustainable development, which, as noted, is an analytic *process* rather than a development outcome.

Sustainable Development

The term "sustainable development" was first used in the World Conservation Strategy in 1980 and widely disseminated by the Brundtland Report (WCED 1987). Within USAID, the concern for sustainability emerged from the experiences of integrated rural development and infrastructure projects that involved significant investment but were not supported by the local population or the government after project funding ceased (DAI 1982). Thus USAID's major emphasis until recently has been on benefit sustainability.

With the publication of Strategies for Sustainable Development (USAID 1994), the Agency entered a new era where benefit sustainability, a goal that still needs to be addressed, was linked to the process of sustainable development. The strategy papers defined sustainable development as "characterized by economic and social growth that does not exhaust the resources of the host country; that respects and safeguards the economic, cultural and natural environment; that creates many incomes and chains of enterprises; that is nurtured by an enabling policy environment; and that builds indigenous institutions that involve and empower the citizenry" (USAID 1994).

Sustainable development is the process in which USAID and host country stakeholders analyze, plan and negotiate USAID's investments in sustaining particular benefits over a given time-frame. It links micro-level benefits with macro-level societal goals and objectives (Diwan 1994). As discussed in Paper 5, the overarching goals include increasing efficiency in the use of resources, alleviating stress, and promoting equitable use of resources, as well as preserving a resource and knowledge base for future generations (intergenerational equity).

This process is grounded in multiobjective analysis, participation, and inclusion. The investment decisions must also be analyzed in light of U.S. and international objectives for sustainable development. Thus, sustainable development is defined at the highest level and includes such considerations as national and international security, global assessment of resource use and depletion, development of and access to technology, information infrastructures, and competition over access to natural resources and markets.

SIX MYTHS ABOUT SUSTAINABILITY/SUSTAINABLE DEVELOPMENT

1. **Sustainable development is an outcome or an activity**

Sustainability in development is an organizing principle and a process rather than a goal. It is the process by which USAID and host country stakeholders analyze, plan and negotiate USAID's investments in sustaining particular benefits over a given timeframe.

2. **Sustainability is a new concept**

Benefit sustainability is specifically addressed as early as 1979 in the USAID literature and concern has existed for some time.

3. **USAID has not well defined the concept**

Guidelines and other detailed discussions have been available since at least 1982, and there has been significant consensus about problems in and pathways to improvement in benefit sustainability (DAI 1982).

4. **Sustainability is not a problem with USAID projects**

A recent study found that, overall, only 18 percent of 44 successful USAID projects had a high probability of achieving benefit sustainability (IRIS 1994). The World Bank sustainability rate was determined to be about fifty percent (CDIE 1990). Not all project benefits *should* be sustainable because projects may be experimental or instructional -- leading to sustainable investments in the long term -- but USAID managers think the proportion should be much higher (IRIS 1993).

5. **USAID is basically unconcerned with sustainability -- it is just a new buzz word**

For several years, USAID has expressed significant concern about, although not always agreement on, the utility of the concept of sustainability. Asia Bureau managers responding to a questionnaire indicated a need for "short, distilled, 'lessons of experience', evaluation findings and 'how to do it' material; information on financial systems and financial mechanisms to promote sustainability; and technical guidelines for sustainability analysis, design and evaluation" (IRIS 1993).

6. **A focus on sustainability doesn't change anything**

Sustainability is not the same as achieving project goals. A focus on sustainability of necessity involves a reorientation of development priorities and approaches. The intensity of this shift is still under debate.

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SUSTAINABILITY IN AGRICULTURE AND NATURAL RESOURCE MANAGEMENT

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WHAT WORKS

Combining community control over resources with government oversight (NRC 1993)

Understanding local practices and incorporating them through farmer-researcher partnerships (e.g., Kotschi 1989); Conversely, teaching farmers and other resource users scientific methods they can adopt for their own needs (Frossard 1993)

Integrating policy issues into a government's agenda rather than setting up separate policy units (Christenson 1990)

Assessing the economic viability of technologies and approaches that promote conservation of natural resources

Working through established groups that have undergone necessary processes of aligning authority and resources rather than creating groups or organizations--e.g., being wary of "cooperatives" that are not really organized by farmers or resource users

Analyzing carefully the strategies, options and "culture" of stakeholders (e.g., logging companies, officials, small farmers, traders)

Assessing infrastructure limitations/potential in relation to technology adoption (market demand, access, government commitment)

Taking a long-term view in order to tackle more difficult situations and populations, and not just doing what is easily sustainable

Focusing technical assistance on capacity building

A. Introduction

There are multiple meanings associated with sustainability in agriculture and natural resource management. Key elements of the concept of sustainability emerged from this sector, including the idea that resources should be used in such a way as to maintain resource flows for future generations, and that inputs employed should enable a(n agroeco)system to maintain output in the long term. Sustainable agriculture itself has a long history and complex definition. For some, it is exemplified by practices such as mulching, manuring and creating multistory gardens that preserve soil quality and moisture with local/low-cost inputs. This form of agriculture has been around for a very long time in traditional societies and is now flourishing in modern iterations such as organic gardening and the permaculture movement.

For others, sustainable agriculture takes on wider meanings and encompasses the ability of farmers to make a living from agriculture.

The discourse on sustainability in this sector has been carried out at theoretical and technical levels that cannot be discussed fully here. The focus of this section is the practical implications of the concept of sustainability for USAID agriculture and natural resource management programs and projects. It outlines the recent issues inside and outside the Agency, and then briefly describes USAID's involvement in sustainable agriculture. The last section describes some new approaches to operationalizing sustainability. The discussion includes forestry, agroforestry, sustainable agriculture, and integrated pest management (IPM).

Brinkerhoff and Goldsmith (1990) describe the differing viewpoints of scientists, economists and management experts on Ag/NRM sustainability:

> Agricultural and natural scientists tend to frame the problem of sustainability in terms of the long-term impact of current farming practices on the global resource base. The chemicals and intensive cultivation associated with green revolution technology can degrade the environment and waste energy resources; scientific breeding of seed may reduce the native genetic diversity of crops, making food supplies more vulnerable to plant disease and pests. Because of such problems, agriculturalists and naturalists are increasingly concerned with identifying and promoting methods of cultivation that can protect and enhance nature's assets, while continuing to produce enough food to satisfy burgeoning populations.
>
> Economists, by contrast, are somewhat less preoccupied with the ecological dimensions of sustainability per se, since the mining of natural resources can be justified from an economic point of view. Their concern is not conservation by itself, but the appropriate trade-offs between economic growth and environmental preservation. Accordingly, economists tend to be troubled by the man-made market distortions that curtail the growth of production and employment in the Third World. The most widespread examples of these distortions are the ill-considered or politically convenient price regimens that penalize the rural sector in many developing countries.
>
> Management experts tend to make the development project or the organization their unit of analysis, and to worry about sustainability in terms of how to meet recurrent costs or permanently improve capacity for implementation. The management perspective on sustainability, however, has evolved away from a narrow project focus, expanding to concentrate more on programs integrated into developing country agencies, and on the question of how to maintain an ongoing flow of goods and services to intended beneficiaries.

B. Cross-Cutting Issues

Though emphasis has been placed on environmental sustainability, the problems and issues of institutional sustainability are receiving increasing attention in this sector (Goldsmith 1988, Eicher 1989, Brinkerhoff and Goldsmith 1990). New technologies, approaches, and policies may be appropriate and well-designed but extended through fragile or elitist institutions. A World Bank study found that "Non-adoption of proposed technologies frequently resulted from insufficient analysis, understanding and appreciation of socio-economic behavior and the

institutional and cultural environments during the design phase" (1985:iv). USAID projects such as the Eastern Waters Initiative (EWI) incorporate sustainability and participation principles in order to build institutional capacity for the appropriate use of technology.

The Eastern Waters Initiative

The Eastern Waters Initiative (EWI) is the U.S. contribution to a multi-donor effort to alleviate the effects of perennial flooding in Bangladesh. Based on the Eastern Waters Study which emphasizes minimal engineering interventions but enhancing peoples' capability to live with flooding, USAID through the Irrigation Support Project for Asia and the Near East (ISPAN) is funding four studies (environment, flood proofing, flood response and Geographic Information Systems) in the 26 study Bangladesh Flood Action Plan. The four studies were selected because they: 1) address the issue of environmentally sustainable development and 2) provide information and identify ways for people to participate in planning their own future. To date, Eastern Waters has 1) developed Environmental Impact Assessment guidelines which have been accepted by Government of Bangladesh for application to all future agriculture, irrigation and drainage projects, 2) greatly increased the awareness of the non-structural aspects of flood control and planning, 3) gained acceptance of peoples' participation in decisions affecting their lives and livelihoods and 4) developed a Geographic Information System which is assisting all Flood Action Plan activities.

As a result of EWI, Bangladesh, for the first time, can use the EIA process to evaluate alternative project designs rather than just as a mechanism to identify and mitigate negative effects from planned projects. The GIS is helping Bangladesh to predict the extent and severity of flooding and to track the movement of river courses over time.

Political and economic changes occur that alter the institutional but not the biophysical aspects of sustainability. For example, conservation approaches and technologies (e.g., erosion control, replanting) that worked in the Belgian Congo in the 1950s did not work in Zaire in the 1980s because of failure to maintain the legal and institutional, as well as the physical, infrastructure necessary for conservation (Russell 1991). Conversely, the biophysical aspects of sustainability can change, and quite rapidly. Thirty years ago, Senegal had significant forest resources. Now forest products must be imported into the country at high prices (Ndoye 1993).

Substantial debate continues about the need to intensify production on good lands to get people off fragile and marginal lands, and the extent to which agriculture is sustainable if it involves heavy use of chemical inputs. Intensification and expanded food production on good lands may prevent "extensification" and resource degradation on marginal lands.[1] On the other hand, intensification without regard for long term environmental consequences will ultimately deplete the resource base. A longer term, broader geographic focus is necessary:

> No single type of land use can simultaneously meet all the requirements for

[1] A major problem that can emerge, however, is rising land values. Land becomes more valuable as real estate than for agriculture, so that farms move to more isolated and degraded land.

sustainability or fit the diverse socioeconomic and ecological conditions. Thus land use systems should be defined according to their environmental, social and economic attributes, and described in detail (NRC 1993).

Other technical issues that arise are 1) measuring the extent of the need to increase food production (Trostle 1994);[2] 2) implementing and institutionalizing cost effective and environmentally sound agricultural and natural resource management technologies with diminishing resources; 3) researching the claim that high yielding varieties (HYVs) are threats to biodiversity; and 4) addressing the long-term costs of adequate germplasm storage.

USEFUL CONCEPTS RELATED TO ENVIRONMENTAL SUSTAINABILITY[3]

Resilience: ability to resist shocks (occasional and traumatic); intermediate level between stability and internal sustainability. A resilient agroecosystem "usually has great diversity and spatial patchiness."

Stability: consistency of production over time

Adaptability; flexibility: the ability to change in response to external and internal perturbations

Autonomy: self-sufficiency of production/revenue generation

Equitability: sharing production fairly

Productivity: getting greater output by substituting relatively abundant for relatively scarce inputs (labor for land) or using new technology

Producing high value export crops in a more ecologically sound manner, and integrating products useful to local communities into agribusiness/export projects are two methods of balancing government needs for foreign exchange earnings, food self-sufficiency, conservation, and the development of community based agroindustries (Byrnes 1993; Thrupp 1994). In order to prevent intensification at the expense of the environment, projects can help to create market opportunities for the variety of products available through sustainable land use (tree byproducts, fallow crops, high value crops, trees or plants with soil maintenance qualities, sustainably harvested products). This approach may have added benefits if the products are harvested from conservation areas, and revenue is used to fund local conservation efforts.

Sustainable agriculture **systems** must address food needs as well as ecological

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Much research has centered on the extent to which distribution rather than production is a factor in famines and food shortages (AAA 1992). The problem has also been deemed one of poverty (inability to generate income to buy food) as opposed to inadequate food production. Nevertheless, as food producers must face market and climate uncertainties, global surpluses are needed.

After Graham-Tomasi 1991 and Marten 1988

> concerns. This requires redeployment of assistance resources to address constraints across the full range of the agriculture sector, including agribusiness in appropriate food, fiber and other produce systems to provide the framework for improving the quantity and quality of supply to urban populations (Balis 1993).

Technology development and diffusion are linked to the socioeconomic elements of sustainability on many levels. More complex social systems and technologies have arisen naturally as population density increases. If the increases are very rapid or localized on fragile lands, however, technology development cannot keep up. Slash and burn farming quickly becomes unsustainable around growing cities and towns. But changes in land tenure, inheritance, or labor patterns, and shifts in investments to more sustainable systems may take generations to develop. Ag/NRM systems are rarely self-sustaining in the developed world, yet we expect them to be in developing countries.[4]

Policy plays a key role in sustainable Ag/NRM development. Panayatou argues that "excessive environmental damage can be traced to 'bad' economics stemming from misguided government policies and distorted markets that set inappropriate prices for natural resources." Governments must intervene and correct market failures and reform policies. The issues of the political economy of resource use have to be addressed, however, in terms of who wins and who loses. Also, it is well known that governments don't control all markets and economic activities (Clark 1988). Thus policy *implementation* and institution building are part of the sustainable development process.

The sustainable development process addresses: 1) policies that affect the types of investments and tasks in research and extension for government and the private sector; 2) how best to deal with different stakeholders and interests in the planning process; 3) which mechanisms (e.g., taxation, economic incentives) enforce or encourage sustainable resource use under specific circumstances; 4) how food aid could be used judiciously to promote sustainable agriculture and NRM; 5) the proper balance between food imports and self-sufficiency in relation to markets and technologies available for food production. Other policy issues include: balancing household and national food security with food import and export policies; overcoming resistance to community control of natural resources; and institutionalizing national accounting and valuation systems that factor in natural resource depletion.

Munn (1992:2727) claims that "the farming industry is sustainable as a result of: (1.) massive energy subsidies (to run farm machinery, to manufacture fertilizers, pesticides and herbicides, and to operate irrigation systems); (2). massive economic subsidies. (More than half of the European Community budget is spent in support of the Common Agricultural Policy.) He adds that "those who worry about the impact of soil salinization, acidification and erosion often overlook the fact that agriculture is far from sustainable even in cases in which soil fertility is sustained!"

> Policy reviews under way at local, national and international levels must be broadened to consider the negative effects that policies have on sustainable land use (NRC 1993).

Another issue in sustainable Ag/NRM is the role of basic research. USAID has made a very substantial investment in Ag/NRM research, including but not limited to support of the international agricultural research centers (IARCs) based in developing countries, the collaborative research support projects (CRSPs) based in U.S. universities, and a multitude of projects supporting national agricultural research systems (NARS). A shift away from long term crop and crop/resource management system research could put at risk the investment of the Agency in increasing the agricultural productivity of LDCs, through loss of trained personnel, deterioration of genetic stock and infrastructure (Ruttan 1993). On the other hand, it may be that some types of investments are not sustainable and should be reconsidered.

Research institutes are developing new technologies that enhance both productivity and the environment, such as pest resistant crop varieties, soil and vegetation management technologies and diversified farm modelling (Centers Week presentations 1993).

> Intensive cropping, agroforestry, agropastoral systems, mixed tree plantations, and to some extent modified forests offer significant benefits depending on land use definitions. For many low resource areas, the newly researched and demonstrated technologies for mixed cropping systems show considerable promise (NRC 1993).

Resource management research, however, can be more time-consuming than basic commodity research because it must characterize farmer practices, and concern itself to a much greater extent with adoptability and adaptability of technologies (IITA Annual Report 1992). Attention must be paid to economic and sociopolitical as well as environmental sustainability such that systems are financially attractive to farmers, and farmers are able to adapt them to their own conditions (infrastructure, extension system, taxation structure, land tenure, community size and labor force). Kusterer (1989) pulled together a synthesis report on "small farmers' attitudes and aspirations" for CDIE that provides a useful guide.

> Adjustment in the structure of national research and extension institutions is necessary to make them more responsive to farmer and producer demands as well as encouraging private sector research and extension efforts in order to improve efficiency (Hanratty 1993).

Environmental Assessments and Sustainability

Environmental assessments (EAs) are a tool for identifying environmental problems and evaluating project success or failure based on environmental considerations. EAs can be used to alert project designers, implementing agencies, and other project partners to environmental issues that require attention. In doing so, EAs can reduce the need for project conditionalities and help avoid costs and delays in implementation. EAs provide a formal mechanism for addressing the concerns of affected groups and local non-governmental organizations.

Where EAs are the responsibility of host country institutions, they help build national environmental capacity. Projects with major potential impacts normally require the strengthening of environmental functions such as monitoring, scientific and technical review, and management of mitigatory measures. In many cases, these functions are located within different units at different agencies. EAs provide a vehicle for improving communication and cooperation among parties responsible for environmental activities and thus can be used to build sustainability and an understanding of sustainable development.

C. Sustainable Agriculture

Sustainability as a concept in Ag/NRM has to be distinguished from benefit sustainability and sustainable development as discussed in the introduction. Sustainable agriculture is a term that often has been employed to mean low-input agriculture but, more generally, it implies an agricultural system that does not in the long term deplete its resource base. Some theorists argue that agricultural sustainability must be viewed even more broadly in terms of a regional or national land use policy with varying levels of intensive cultivation and resource conservation, thus integrating production (food supply), revenue generation (farm income), and resource conservation.

> Science has recently done a much better job of measuring losses where the environment is concerned than it has in fully analyzing alternative approaches to food production. The race for benchmarks and measures has left the agricultural community on the sidelines, still largely focused on the same measures of productivity that predated the environmental revolution (Bissell 1993).

Sustainable agriculture in the context of sustainable development can be seen as a dialogue between farmers and policy makers (as well as landowners, traders and consumers) as to the availability, quality and cost of resources (land, labor, capital) allocated for agricultural production and conservation of the resource base. It is a process of valuing different natural resources in relation to their immediate, medium and long term use for the "five Fs": food, fodder, fiber, fuel, and foreign exchange.

Environmentally sustainable agriculture (ESA) has been defined as "a management system for renewable natural resources that provides food, income, livelihood for present and future generations and that maintains or improves the economic productivity and ecosystem services

of these resources" (ENRIC 1993). ESA has been part of USAID projects for many years in the form of agroforestry, integrated pest management (IPM) and components of traditional agricultural production projects, in part as a result of environmental assessments of projects, within research at the CRSPs and the IARCs funded entirely or in part by USAID. A new CRSP, SANREM (Sustainable Agriculture and Natural Resources Management), launched in 1992, is seen to be a pioneer effort to focus directly on sustainable agriculture within the context of local participation.

SANREM

The Sustainable Agriculture and Natural Resource Management Collaborative Support Project (SANREM CRSP) has been designed to conduct innovative, integrated, farmer-participatory, systems-based research promoting sustainable agricultural production and natural resource management systems in tropical and sub-tropical zones. Research takes into account the indigenous knowledge and primary interests of end-users, including farmers, farm households, and rural and urban communities.

The SANREM process has two phases of implementation. The first phase of implementation is as follows: 1) Site Selection; 2) Pre-reconnaissance; 3) Participatory Landscape/Lifescape Appraisal; 4) Workshop; and 5) Workplan. The second phase of implementation is the execution of the integrated Workplan.

The Pre-reconnaissance consists of collaborator networking, identification of ongoing projects at the site and the gathering of secondary literature related to the site. Secondly SANREM typically sends in a 5-6 person team from the U.S. Institutions (Universities and NGOs) to do a more detailed Reconnaissance. This includes institutional and community network strengthening and further information gathering. The Participatory Landscape/Lifescape Appraisal (PLLA) is a diagnostic survey in the community which gathers community perceptions and information related to the Landscape/Lifescape. This is done through a variety of participatory methods including open interview/conversations. In the Philippines, the community identified eight ecozones in the landscape and helped to identify how the ecozones were linked both biologically and socially. From all of the information came a number of research themes.

Projects focused extensively on sustainable agriculture, however, as defined by the environmental community, are relatively new to USAID. A search of agriculture evaluations in the USAID document database revealed very little mention of sustainable agriculture, indicating that this thrust did not emerge from internal evaluations of agriculture projects. By FY 1991, however, USAID claimed that it provided $88.3 million to support 75 projects that promoted sustainable agricultural practices, policies, and research (ENRIC 1993). There is debate over whether sustainable agriculture should or even must include economic viability considerations such as sustaining or increasing agriculture's contribution to household and national revenue, and providing affordable food to consumers. The USAID agriculture office's move to the Global Bureau's economic growth center may encourage this definition.

Regional differences exist in resource endowment, economic growth potential, institutional sustainability and environmental challenges. The Near East focus is on water use priorities and high value crops. The LAC region has also emphasized high value crops as well as increasing productivity through IPM. Asia faces environmental problems as a result of very

rapid growth in the agricultural sector. African agriculture is confronted by institutional as well as technological challenges in a politically stressed environment (Eicher 1989). Much important research in sustainable agriculture, however, has come from Africa (Africa Bureau 1993; IITA Annual Report 1992).

Issues in Sustainable Agriculture within USAID

The fragmentation or dislocation of agricultural issues in current USAID strategies may divert attention away from development of a sound agricultural policy integrating local and national revenue generation, nutrition, environmental and food supply issues.

USAID has a comparative advantage in designing and implementing sustainable agriculture projects because of its in-country presence (Africa Bureau 1993). The Agency has, however, downsized its investment in agricultural research relative to the investments of other donors.

The vast body of indigenous knowledge on land use systems must be recorded and made available for use in national development planning (NRC 1993; Warren and Cashman 1988). Practitioners are now debating what this means in terms of intellectual property rights, access, and changes in scientific discourse and methods.

New partnerships must be forged among farmers, the private sector, non-governmental organizations, and public institutions to address the needs for research and development and the needs for knowledge transfer of the more complex, integrated land use systems.

D. Integrated Pest Management (IPM)

Integrated Pest Management (IPM) is a set of technologies designed to reduce chemical use by integrating biological control methods into pest reduction strategies. It entails study of farm ecology (pest lifecycles, plant/pest interactions) and can involve preparing simple biological pest control applications or using pest predators. More than 5,400 students from 46 developing countries have received training from USAID projects ranging from integrated pest management to the diagnosis and treatment of pesticide poisoning. USAID has also helped develop IPM guidelines (USAID 1992).

According to Jahn (1993:1), IPM is

> the selection, integration, and implementation of pest control techniques based on economic, ecological, and sociological consequences. Reliance on a single pest control method is rarely successful. IPM is an attempt to integrate all available pest control methods for maximum efficiency, profit, and safety.

In Indonesia, he notes, USAID supports one of the most successful IPM programs in the world. The program receives technical support from the Food and Agriculture Organization (FAO) of the United Nations (UN). After IPM training, the number of insecticide applications per field decreases by over 60%. Returns among IPM farmers are approximately

one third higher than non-IPM farmers cultivating under similar conditions.
USAID has several active projects involving IPM. Lessons learned for sustainable development and sustainability include:

- Gross farm income is positively related to extension contact. In other words, larger growers are more likely to keep up with new research accessed through extension services, and to adopt IPM practices. The growers who have a higher socioeconomic status will likely have greater innovation (Peanut CRSP 1993).

- Successful adoption of IPM may depend on host country or NGO acceptance and investment, as there is a significant training component. For example, the adoption of IPM as the national pest control policy in Indonesia required commitment of all parties to finance training and outreach.

From the 1993 Global IPM Workshop in Thailand, Dr. Walter Knausenberger (USAID/AFR/ARTS) and Gary Jahn (AAAS fellow) identified pre-conditions that allow the development of national IPM programs:

A paradigm shift in the organizations that do agriculture research, training, and extension. Rather than beginning with the philosophy "for every pest there is a pesticide," agriculture organizations should adopt the philosophy "how do we restore balance to this system?" Key differences exist between the old and the new approach to pest management:

> The old approach delivered assistance from the top down by assisting research and extension organizations first, and building a capacity toward the field and the farmers. Farmers were passive recipients of technology.
>
> The new approach empowers farmers. IPM enables farmers to analyze options and make their own decisions. Assistance takes a more direct route via NGOs, farmer organizations, and local government. The new approach is the Peace Corps approach, where assistance is as direct as possible. IPM is understood as an integral part of increased farm productivity and sustainable development. It is not seen as an end itself but as a means to improve economic, social, and environmental sustainability of crop production; to empower farmers; and to encourage links between research and implementation. Attention is given to objective interpretations of agricultural data, and suitable policies that do not encourage pesticide use.

Recommendations from the Group Discussions at the Global IPM Workshop

To promote the availability of IPM technology, it is essential to involve farmers and producers in defining crop protection

To link development assistance with implementation, development agencies must conduct pilot projects that serve to demonstrate the utility of IPM

To assign a higher priority to IPM, governments and donors could begin by identifying farming systems that are unsustainable due to pest or pesticide problems

To change national policies to support IPM, development agencies must analyze the existing policies to determine their effect on IPM. The economic, environmental, and health benefits of policies that support IPM should be highlighted in these analyses. Results of the policy analyses must be disseminated among national and international policymakers (Jahn 1994).

E. Forestry and Agroforestry

The concept of sustainability has made its way into the Agency's natural resource management project and program portfolio in a number of different ways over the last decade. USAID has placed much greater emphasis on community participation in designing, implementing, and managing projects, stronger partnerships with NGOs and PVOs, and on the social and economic causes and consequences of environmental degradation.

Although the Agency has attempted to integrate benefit sustainability into all aspects of its activities, agriculture and forestry are two areas of greatest range and depth of experience. Introduction of a sustainable development process both complements and reinforces an ongoing process of evaluating the impacts of these activities.

Experience to date has shown that many forestry projects require periods of financing that extend far beyond normal project cycles. Compared to many other sectors, forestry development has a high ratio of operating-to-capital costs, which puts pressure on governments seeking to control public expenditures. These conditions have made it necessary for project designers to give explicit attention to alternative financing arrangements and broader stakeholder involvement.

"Natural forest management" has been the rallying cry of forestry professionals concerned with sustainability. In its simplest form, natural forest management is the controlled harvest of timber species in natural forests. Concern for sustainability of harvests has led to adoption of silvicultural and protective measures to sustain or increase the commercial value of forests after the initial logging. Further challenges include how to introduce non-timber resources into the value equation. As equity and long-term perspectives are brought to the forefront, a truly complex picture emerges (ASSETS 1994).

Good examples of sustainable forest management are hard to find. Though technically feasible, natural forest management is often constrained by non-technical obstacles such as shortages of trained staff, landlessness, population pressures, governmental subsidies, and concessions. In addition, the relationship between forestry sustainability and maintenance of biodiversity and other ecological functions is not often addressed directly in natural forest management activities. If conflicts do exist among these different though related objectives, they must be identified and dealt with in the earliest stages of project planning.

Several pilot efforts are underway that attempt to demonstrate low-cost, community-based natural forest management. In Niger's National Forest of Guesselbodi, USAID partners have observed visible regeneration of vegetation without introduction of exotic species. In Costa Rica, both the BOSCOSA and FORESTA projects operate in buffer zones around protected areas. The BOSCOSA project features the use of conservation easements, forest trusts, and community forest concessions. A forest management plan is in place in the FORESTA project, and progress is being monitored using a geographic information system (GIS).

Lessons from USAID/Bamako's Forestry Initiatives[5]

There is a clear link between democratization efforts and the success of forestry initiatives.

Failure to develop adequate baseline surveys, information systems and institutional linkages for information exchange in most USAID-funded forestry initiatives have partially limited their usefulness in identifying extendable technologies. Few quantifiable biophysical indicators of change can be found that can trace change to USAID-funded activities.

Village woodlots for fuelwood failed for biophysical, socio-political and economic reasons (including such variables as economic value of species planted and laws governing pruning). The only "successes" that occurred in village woodlots occurred when village level institutions were particularly strong.

Group technologies and practices were adopted less readily than technologies and practices implemented by individual households. Group practices that were adopted had the following characteristics: (1) other options were blocked or not feasible; (2) they have clear short term income/food benefits; and (3) benefit or profit sharing mechanisms are clearly envisioned or in place.

The more sustainable of USAID's recent forestry subsector interventions, when combined with resource management and sustainable agriculture activities, are those that provide reasonable returns to labor, measured in terms of food security.

Assembling and extending multiple technologies and practices in forestry, natural resource management and sustainable agriculture enhance the ability of Maliens to implement the forestry technologies and practices.

Local level institutional arrangements are absolutely essential in making the programs sustainable in the long run. USAID has only recently begun to finance work in this area, and little work is done by other donors.

A flexible approach with a "menu" of technology choices has higher likelihood of sustainability. Both formal and informal institutions must have enough capacity to meet the "sufficient and necessary" criteria for the technology to be adopted.

Recommendations for increasing sustainable forest management include local participation, flexible management plans, effective land-use plans, clear and enforceable guidelines and standards, and better training.

> Weaknesses in the information systems of past USAID forestry projects underscore the importance of providing adequate funding to support data collection activities for proposed agroforestry projects (Chew 1989).

In discussing the concept of sustainable forestry at the policy level, the World Bank's Robert Goodland has carried the environmental argument farther than anyone in the development community. He feels that any consumption that is not sustainable cannot be counted as income. Prevailing models of unsustainable development treat consumption of natural capital

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From Fessenden and Duval 1994.

as income; however, for Goodland, consumption of natural capital is liquidation, the opposite of capital accumulation.

Goodland sees that investing in natural capital is essentially an infrastructure investment. He makes the distinction between sustained yield (S-Y) and environmental sustainability (ES) in that S-Y counts only the service of the product extracted (e.g. products made from timber) while ES counts all the natural services of the sustained resource (forest resources such as medicine, dwelling place, food).

> An important issue for USAID will be developing new ways to evaluate and measure the impact of sustainable agriculture projects which, to be effective, must be multidimensional and long-term. In none of seven agroforestry projects evaluated was it possible to quantify E/NRM outputs, much less long term impact (CDIE 1992).

F. Tools

Sustainability is a complex issue in this sector, as it includes issues of maintaining the viability of the biophysical resource base, as well as economic and institutional viability under conditions of increasing stress.

Tools for analyzing resource use, depletion and social and economic costs are presented to USAID in the environmental economics and sustainable development (ASSETS) course. One lesson learned from this course is that economists are not uniformly in agreement on how to integrate natural resources into economic analyses. Much variability depends on the purpose of the analysis and the client. Nevertheless, the toolkit is a growing and vital addition to traditional economic analysis. In addition, there are sociological and anthropological research methods which complement these economic analyses.

Tools for Sustainability Analysis

National accounting (UN standards now being universally adopted)
Natural resource valuation methodologies (ASSETS course--materials available)
GIS systems and analyses (see Martin 1994 for institutional issues)
CIESIN and other databases (CIESIN 1993)
Sustainability indicators (Rodale international on-line conference)
Participatory Rural Appraisals (PRAs) (Kabutha et al); ECOGEN approach (Slayter-Thomas 1994)
Integrated research programs: e.g., ethnographic, ethnobotanical, economic and agronomic (CIMMYT 1992; SANREM)
Case study analyses (Kusterer 1989)
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G. Conclusion

The discourse on sustainability began in the agriculture and natural resource management sector. Physical resources (e.g. soil, water) are valued in relation to conservation and diverse uses, while institutions that control and transfer access to resources are also being evaluated. The need to feed a growing population as well as maintain the resource base for future generations leads to many decision points for USAID. It is not enough any more to develop good technology. Technology must be adopted and integrated into sustainable systems that regulate use and access over time.

The concepts of environmental and economic sustainability, often viewed as antagonistic (conservation vs. growth) must be seen as mutually reinforcing. Tools exist which enable decision makers to identify critical problem areas and find solutions that foster integration of these concerns. The challenge is to make this type of planning an integral part of development planning and policy dialogue.

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