

PN ABX-975
98-000

AGRICULTURAL POLICY ANALYSIS PROJECT, PHASE III

Sponsored by the

U.S. Agency for International Development

Assisting USAID Bureaus, Missions and Developing Country Governments
to Improve Food & Agricultural Policies and Make Markets Work Better

Prime Contractor:

Abt Associates Inc.

Subcontractors:

Development Alternatives Inc.

Food Research Institute, Stanford University

Harvard Institute for International Development, Harvard University

International Science and Technology Institute

Purdue University

Training Resources Group

Affiliates:

Associates for International Resources and Development

International Food Policy Research Institute

University of Arizona

Project Office: 4800 Montgomery Lane, Suite 600, Bethesda, MD 20814 · Telephone: (301) 913-0500
Fax: (301) 652-3839 · **Internet:** apap3@abtassoc.com · **USAID Contract No.** LAG-4201-C-00-3052-00

AGRICULTURAL POLICY ANALYSIS PROJECT, PHASE III

Under contract to the Agency for International Development, Bureau for Global Programs, Field Support & Research,
Economic Growth Directorate, Office of Agriculture & Food Security

Prime Contractor: Abt Associates Inc., Project Office: 4800 Montgomery Lane, Suite 600, Bethesda, MD 20814 • Telephone (301) 913-0500
Fax (301) 652-3839 • Internet: apap3@abtassoc.com

INDICATORS LINKING NATIONAL POLICY AND LOCAL SUSTAINABILITY: APPROACHES BY THE USAID AGRICULTURAL POLICY ANALYSIS PROJECT (APAP)

July 1994

APAP III
Research Report
No. 2001

Prepared for

Agricultural Policy Analysis Project, Phase III (APAP II)

USAID Contract No. LAG-4201-C-00-3052-00

Authors: David Wilcock, Development Alternatives, Inc.
Richard English, Development Alternatives, Inc.

**INDICATORS LINKING NATIONAL POLICY AND
LOCAL SUSTAINABILITY: APPROACHES BY THE USAID
AGRICULTURAL POLICY ANALYSIS PROJECT (APAP) ***

by

David Wilcock and Richard English **

July, 1994

* Paper presented at the SANREM CRSP Conference on Indicators of Sustainability, Arlington, Virginia, August 1-5, 1994.

** The authors, respectively, are Senior Agricultural Economist, Economics Group, Development Alternatives, Inc. (DAI) and Guidelines and Methods Advisor for APAP III; and Natural Resource Management Specialist, Sustainable Water, Agriculture, and Resource Management Group (DAI, 7250 Woodmont Ave., Bethesda, MD. 20814).

TABLE OF CONTENTS

1.	INTRODUCTION	1
1.1.	Definitions of Sustainability	1
1.2.	Models, Causal Relationships, and Indicators of Sustainability	5
1.3.	Objectives of USAID APAP and the Needs of Its Clientele	8
2.	WORK TO DATE ON AGRO-ECOLOGICAL SUSTAINABILITY ISSUES BY APAP PARTNERS	11
2.1.	Natural Resource Policy Inventories in Latin America	11
2.2.	General Approaches to Policy and Sustainability Issues	12
2.3.	Methods: Use of the Policy Analysis Matrix and Cost Benefit Analysis	13
2.4.	Indicators of Sustainability in Past APAP Work	14
3.	FUTURE DIRECTIONS	16
3.1.	When Indicators are Needed: Serving the Current and Future Needs of APAP Clients and Contributing to an Evolving Methodology	16
3.2.	Options for Future APAP III Work in Policy and Agro-Ecological Sustainability	16

BIBLIOGRAPHY

FIGURE 1.1:	POLICY, PRICES, RESOURCE-USE BEHAVIOR AND OTHER FACTORS AFFECTING AGRO-ECOLOGICAL SUSTAINABILITY	6
--------------------	-----------------------------------------------------------------------------------------------------------------------	----------

1. INTRODUCTION

Indeed, agricultural sustainability — though broadly recognized as important — is given little weight in economic policy-making. No commonly employed indicators measure it, no accepted conventions value it, and no widely accepted definition describes it. If agricultural sustainability is considered at all, it is an afterthought. (Faeth, 1993, p. 1.)

The Agricultural Policy Analysis Project III (in its 11th year of operation) ¹ is pleased to be participating in this conference on "Indicators of Sustainability". The purpose of this paper is four-fold:

- To examine the question of indicators of sustainability in the context of the project's mission of providing policy analytical and training services to USAID field missions and the national governments with whom they work and to central bureaus of USAID/Washington;
- To review work conducted in the previous five years of APAP II that is relevant to the relationship between national agricultural policy and the sustainability of natural resources and man-made production systems at the sub-national level;
- To indicate likely directions for APAP III work on sustainability in the next few years; and
- To participate in the methodological debate on how to devise useful, operational indicators that can be used by USAID and cooperating national governments in the promotion of sustainable agro-ecological and socio-economic systems at the sub-national level (local, watershed, river basin, etc.).

1.1. Definitions of Sustainability

In 1987, the World Commission on Environment and Development highlighted natural limits to world-wide trends in resource utilization and called for an alternative developmental strategy that "sustained human progress not in just a few places for a few years, but for the entire planet into the distant future." The Commission's Bruntland Report defined this sustainable development as one that "meets the needs of the present without compromising the

¹ APAP III is funded by USAID's Bureau for Global Programs, Field Support and Research (the "Global Bureau"). The prime contractor is Abt Associates of Bethesda, Maryland. The authors of this paper are employees of Development Alternatives, Inc., one of the core subcontractors in project implementation.

ability of future generations to meet their own needs." The Brundtland report articulated the growing realization among the governments of the economically developed world that present levels of per capita natural resource consumption "cannot possibly be generalizable to all currently living people, much less future generations, without liquidating the natural capital on which economic activity depends." (Goodland, 1993, p.1) Since then, donor agencies, international NGOs, development professionals and developing country governments alike have been attempting to quantify and operationalize the concept of sustainable development in an effort to formulate more environmentally sound and socially equitable development strategies.

There is considerable debate over what constitutes "sustainable development".² This debate was brought sharply into focus by the recent SANREM/CRSP electronic conference on Indicators of Sustainability. In his summary of the proceedings, Bob Hart notes that approaches to sustainability and the methods for measuring sustainability will vary depending on both what an agency or institution deems in need of being sustained, and the perspective (e.g., macroeconomic, community development, or farm production system) that analysts apply to the subject (Hart, 1994, p.3).

As we will describe in more detail below, the perspective of the USAID APAP project is agriculture and natural resource policy analysis with the aim of strengthening the capacity of donor and host government development institutions to formulate and implement rational and coherent policy. It is useful here to briefly review the sustainability literature, to suggest the approach(s) to sustainability that APAP might embrace, and to begin to suggest the types of indicators that would demonstrate and monitor the impact of national policy on local-level sustainability.

The approaches that are used to define sustainability in the current literature can be grouped in the following four categories. This categorization is by no means definitive, nor are the approaches categorized exclusive; the approaches are, in fact, interdependent.

- **Environmental** — emphasizes the biophysical dimensions of sustainability and the interrelated nature of human and natural ecosystems. This approach stresses the productive use of natural resources such as soil, groundwater, biomass, and species diversity in ways that do not deplete, contaminate or otherwise degrade the usefulness of these resources for present and future generations (WRI, 1992, p.2);
- **Economic** — emphasizes natural resources as capital goods that provide a flow of economic benefits over time. This approach recognizes that economic activities can lead to the degradation of biophysical resources, and that this degradation must be taken into account and alleviated if future generations are to have the same or higher levels of welfare as the present generation (WRI, 1992, p.99; Schuh and Archibald, 1994, p.18);

² Pezzey (1992, pp. 55-62) provides a list of 60 definitions from his review of the literature.

- **Social** — emphasizes the human dimensions of sustainability and the importance of widespread public participation in the management of natural resources to promote the equitable access to, and use of, those resources. This approach holds a stable population, universal education, opportunity for employment, universal health and reproductive care, and the establishment of gender equality as prerequisites to equitable development (WRI, 1992, PP.3, 5-6; WRI, 1994, p.43); and
- **Technological** — emphasizes efficiency in productive processes that minimizes nonrenewable consumption of energy and natural resources. This approach advocates the rapid introduction of "clean" technology to developing countries to prevent the degradation and depletion of resources and promote improvements in production (e.g., biotechnological advances in food production) and processing of economic goods.

Underlying all these definitions is the concern that formal and informal institutions and policies that govern the transfer of assets to future generations are adequate to ensure basic standards of human welfare in the long-run (Norgaard, 1993, p.3).

As we noted above, the focus of APAP is agricultural policy. So let us turn the discussion from sustainable development to a set of its essential components, *sustainable agriculture*. Sustainable agriculture has its own array of definitions but these are perhaps best summarized by Luther Tweeten:

Sustainable agriculture emphasizes natural resource conservation and the prudent use of synthetic chemicals to ensure safe and adequate supplies of food and water for the well-being of both current and future generations. Sustainable agriculture envisages agriculture as part of an interdependent farm, agroecological, institutional and socio-cultural *system* (Tweeten, 1993, p.34).

The concern among donors, development agencies and host governments for agricultural sustainability is linked to the desire to promote food security and improve the welfare of rural populations for generations to come. The main tools of sustainable agriculture are policy and agrarian reform, public participation, income diversification, land conservation and improved management of inputs (UNCED, 1992, pp. 2-3). From the perspective of policy reform, analysts are concerned with the impact that monetary and fiscal policy, agricultural input subsidies, agricultural trade barriers, output pricing, land tenure, natural resource management policy and socio-economic equity all have on the transfer and application of sustainable agricultural technology and practices.

For the purpose of this discussion, we concentrate on two dimensions of agricultural sustainability as defined by Tweeten: the farm production system and the agroecological system.

Sustainability at the farm production level is determined by prices, the technologies available to farmers and the impact of these technologies on the natural resource base. Technologies generally include practices to control pests and weeds, to manage and maintain soil

fertility and soil moisture, and other means of resource conservation. In a given agro-economic context, farmers may employ one set of production technologies to maximize profits from the land over the short-run; in another context, farmers may accept some limitations on short-run profits to ensure longer-run productivity of their farms and the natural resource base on which that productivity depends. In the US, practices aimed at promoting longer-run resource conservation more recently have been termed "environmentally sound agriculture" (Tweeten, 1992) or "alternative agriculture" but major government-sponsored programs, particularly in the area of soil conservation, have been operating for 60 years since the "dust bowl" era.³

Sustainability at the level of the agroecosystem is linked to concerns for the health and regenerative capacity of the air, water, soil, forest and climate that supports food production. From the national/regional perspective to the perspective of the family farm, the impact of poor resource management are well known. These include: *soil erosion and loss of soil fertility* from overgrazing and inappropriate cultivation practices; *soil waterlogging and salinity* from excessive application of irrigation water; *contamination of food and water supplies* from the unmanaged application of agrochemicals, animal waste and saline soils; *deforestation* from the overharvesting of food, fuelwood and fodder as well as clearing for farmland; and *loss of biodiversity* from increases in land-use intensity and static farm production regimes that tend toward monoculture.

³ Many of the practices that comprise alternative agriculture (see below) are widely employed by subsistence farmers throughout the world. These practices are *alternatives* to practices that have become conventional in the commercial agriculture of the developed world (e.g., the heavy reliance on agro-chemical inputs and mechanized farming) and, to some extent, to developing countries that have adopted the "Green Revolution" technology to boost food production.

World Resources Institute (1992, p. 100) defines alternative agriculture as "practices such as crop rotation, reduced tillage or no-tillage, mechanical/biological weed control, integration of livestock with crops, reduced use or no use of chemical fertilizers and pesticides, integrated pest management, and provision of nutrients from various organic sources (animal manure, legumes).

The National Research Council (1992, p. 27) defines alternative agriculture is any system of food or fiber production that:

- Systematically incorporates natural processes, such as nutrient cycles, nitrogen fixation, and pest-predator relationships, into the agricultural production process;
- reduces the use of chemicals and fertilizers with the greatest potential to harm the environment or the health of farmers and consumers;
- Makes greater use of the biological and genetic potential of plant and animal species;
- improves the match between cropping patterns and the productive potential and physical limitations of agricultural lands in order to ensure the long-term sustainability of current production levels; and
- emphasizes improved farm management and conservation of soil, water, energy and biological resources.

1.2 Models, Causal Relationships, and Indicators of Sustainability

For the purposes of this paper, we will introduce our discussion of indicators through the use of a simple conceptual framework represented in Figure 1.1. Essentially we are interested in how:

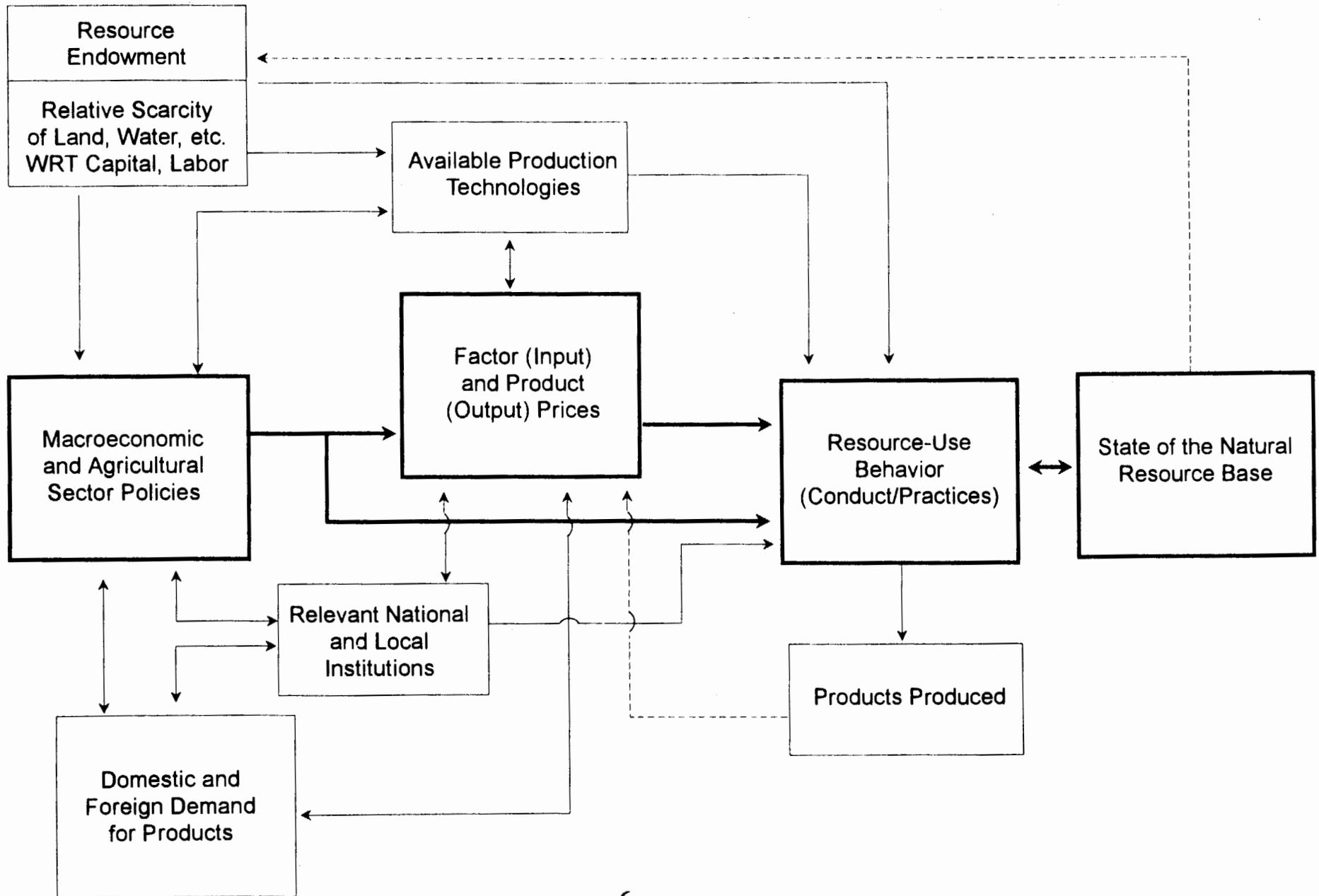
- basic resource endowments, supply and demand conditions (prices), institutional factors, the range of production/marketing technologies available, and specific politically-determined policies affect;
- the behavior (or conduct or practices) of farmers, foresters, fishermen and others who use the natural resource base to produce a range of marketable (or consumable) products, which, in turn affects;
- the state (health, sustainability) of the natural resource base.

In this "model" we are essentially looking at the relationship among national-level policies (laws, investment programs, etc.), prices, behavior in resource use, and the state or "health" of the natural resource base (these are the core relationships for us: they are represented more prominently in Figure 1.1). However, we also emphasize that the context within which these core relationships exist varies dramatically from country to country. Among the most difficult country circumstances to deal with are when great material poverty combines with natural resource scarcity (shortage of land, for example) to put enormous pressure on the use of that scarce resource. The reader will also notice the following:

- The arrows in our model imply dynamic processes (with feedback loops) rather than static relationships;
- The heads of arrows imply potential causal relationships, but we ignore all the practical difficulties in determining causality;
- In violation of standard practice in economics, we have not "collapsed" all of these relationships to supply and demand relationships since that would leave us with only two indicators, price and quantity.

In our simple conceptual framework we can talk about indicators in all dimensions of the implied relationships: baseline conditions, in policies and related institutions, in producer behavior, and in the measurement of the state of the resource base. Some indicators may be binary in nature (presence or absence of a particular technology), ordinal (a continuum of weak to strong forest protection laws), or fully quantifiable (tons of soils lost to the average hectare of cultivated hillside, income, yields, etc.). In addition to knowing whether the natural resource "problem" is being "solved", we are also interested in the measurement of change in the behavioral relationships and how well we understand those relationships. The more the

FIGURE 1.1: POLICY, PRICES, RESOURCE-USE BEHAVIOR AND OTHER FACTORS AFFECTING AGRO-ECOLOGICAL SUSTAINABILITY



relationships become formalized into a mathematical model, the more "indicators" simply become "measured variables".

As the title of this paper indicates, we are interested in the relationships between national policies and the socio-economic and natural resource sustainability of alternative systems for using natural resources at the local level. For certain natural resource problems, national policies are central to finding solutions; in others they are marginal or totally unimportant. Getting "policies right" (or "prices right") is not always the answer to every problem; but it is right often enough to justify systematic consideration in the context of efforts by multidisciplinary teams.

The list of the types of policies that, over different time frames, can have a substantial impact on the use of natural resources, is a long one. Attempts to develop taxonomies of the universe of relevant policies are inherently arbitrary but the results are useful in conveying the wide range of what might be covered. Johnston, in the first draft of *The Green Book* (APAP II No. 406),⁴ provided an analysis of relevant policies in the following categories:

- Macroeconomic
- Social: Population
Indigenous Peoples
Labor
- Resources: Land Tenure and Use
Water and Watershed Management
Energy
Environment
- Agriculture: Crop Agriculture and Livestock
Forest Management
Coastal Zone Management
Protected Areas and Wildlife

The policies that often have been given the greatest attention by development economists (as evidenced by their prominence in many structural and sectoral adjustment reform programs)⁵ are those that fall under the macro and crop agriculture categories. These include:

- Macroeconomic
 - Monetary policies (money supply, interest rates)
 - Credit policies
 - Tariff and trade policies

4 APAP II publications are listed in the bibliography by their publication number rather than by author.

5 In terms of indicators, the World Bank's recent analysis of the relationship between policy reform and national economic performance in 29 Subsaharan African countries (World Bank, 1994), offers an interesting methodological discussion of attempting to measure "sound macroeconomic policy" in a comparable manner.

- Exchange rate policies
- Export Promotion policies
- Fiscal management (including debt financing and debt-for nature)
- Crop Agriculture and Livestock
 - Product pricing controls and supports
 - Input subsidies (credit, chemicals, machinery) and price controls
 - Direct Government marketing of inputs and products
 - Regulation of pesticide and herbicide use

Whether specific policies are an important part of a perceived unsustainable resource use problem must be determined on a country by country basis. For example, in Morocco analysts have recently become concerned with the degradation of fragile rangeland soils due to an expansion of dryland cereals production. These are rangelands that are often only used for seasonal livestock grazing which is very important to Morocco's landless rural workers and to farmers with very small total acreages. High prices for domestic cereals are encouraging farmers to expand into marginal areas. These high, stable prices are due to a combination of policies: high, state-controlled domestic cereals prices, government control and subsidy of marketing costs, and corresponding high rates of tariff protection against imported cereals. While contributing to meeting a stated Government of Morocco objective of greater cereals self-sufficiency, cereals production is most likely not a sustainable use of the more marginal pasture lands. This cluster of policies and may not be sustainable from a political-economy point of view as well, due to excessively high consumer cereals and flour prices. Changing this interrelated set of policies would have a significant impact on reducing pressure on some of the country's most fragile agricultural lands.⁶

1.3. Objectives of USAID APAP and the Needs of Its Clientele

As stated in the USAID project design document (the "project paper"), the APAP III project is intended to provide support to USAID missions and their host-country organizational counterparts (governmental and otherwise) to achieve the following "project purpose":

The purpose of APAP III is to assist host-country decision-makers in identifying issues and resolving problems concerning agricultural policy, especially issues relating to market performance, equity, and agricultural/environmental sustainability (USAID, 1993, p.13)

More generally, USAID is putting major emphasis on assuring that the activities it funds in LDCs will contribute to "sustainable development", "characterized by economic and social growth that does not exhaust the resources of a host country" and that "enlarges the range of freedom and opportunity, not only day to day, but generation to generation" (USAID, 1994,

⁶ It is of interest to note that although USAID and the World Bank have been funding cereals policy reform work in Morocco for the past ten years, consideration of the negative environmental impact of these policies of high price supports has only recently entered into the "policy dialogue" with the Government of Morocco.

p.4). USAID is also an organization that, for at least the past twenty years, has formally required that all of its projects develop objective measures or indicators of projects meeting their stated objectives and goals, although these objectives have not always included sustainable human and ecological systems. It indicates that it will meet these high standards through "integrated country strategies" developed in "close cooperation with host governments, local communities, and other donors" (USAID, 1994, p.6). The current strategy document goes on to more detail on how the overall sustainable development objectives will be accomplished in the programs areas (referred to as the "new four pillars") of:

- Environmental Protection;
- Building Democracy;
- Stabilizing World Population Growth and Protecting Human Health;
- Encouraging Broad-Based Economic Growth.⁷

In operational terms, the primary clientele of the APAP III project are USAID country resident missions and the national governments with whom the missions work, and the AID central bureaus in Washington. The needs of the that clientele, concerning natural resource management issues and the particularly the relationship between national policy and sustainable agriculture at the local level, involve the sequence of steps involved in problem identification and remediation:

- **Identification** of issues and problems in production systems that involve the utilization of the country's natural resource base;
- Country-specific **enumeration** of macro-economic and sectoral policies involved in the identified problems, and **diagnosis** of the nature the causal relationships between existing policies and institutions and the specific resource-use behavior that is giving rise the identified problem. To be effective, this step must employ, to the maximum extent possible, the **participation of all groups with a significant stake** in the problem (stakeholders). As is well known, this is not always easy for host governments to do on their own;

⁷ In order to achieve these objectives more efficiently, AID has recently reorganized many of its development personnel into a "global issues bureau" whose main subdivisions ("centers of excellence") reflect the above four main program areas. (In the new AID structures, projects supporting agriculture and agricultural policy—such as APAP and the SANREM CRSP—come under the Office for Agriculture and Food Security in the "Center for Economic Growth").

- **Analysis of available information and design of remediation strategies at the appropriate geopolitical level and specific projects (often experimental or pilot projects) to implement those strategies;**
- **Implementation of project activities, including systems to monitor and evaluate progress in meeting remediation and sustainability objectives.**

The needs of a given country, with respect to the steps above, obviously depend on the degree to which particular natural resource situations are perceived as problems (level of "environmental consciousness"), the extent of previous work in issue identification, problem analysis, and past attempts at finding operational solutions. We can either start from the beginning, or join the process somewhere in the middle.

Indicators of sustainability become relevant at different points in the analysis of the causes of problems, and in the design, implementation and monitoring of solutions. Since we are looking at indicators in a process that may alter the streams of resulting economic benefits for the different groups involved, the indicators inevitably have a strong political content, regardless of their scientific objectivity or precision. Thus, one of the key operative questions becomes, "**whose indicators count?**"

It is within this context that we will examine previous APAP work on policy and sustainable agriculture and begin to define the types of activities that can be undertaken by the project in the next several years.

2. WORK TO DATE ON AGRO-ECOLOGICAL SUSTAINABILITY ISSUES BY APAP PARTNERS

Even though it was originally not one of the declared themes of APAP II (1988-93), the project did a substantial amount of work in the development of applied methodologies for the assessment and analysis of agricultural and macroeconomic policies most directly affecting natural resource utilization. In this section we review this work and its implications for indicator development.⁸

2.1. Natural Resource Policy Inventories in Latin America

Between 1989 and 1992, APAP II conducted a series of natural resource policy inventories in six Latin American countries: Belize, Honduras, El Salvador, Costa Rica, the Dominican Republic, and Guatemala.⁹ The policy inventories were seen as a first step in understanding the existing policy environment and the political, economic and social context that circumscribes and determines natural resource management in the countries of the region. To provide this essential background information, the policy inventory entailed a set of standard tasks:

- Identifying all policies and laws from both the public and private sectors at the regional, macroeconomic and local levels which affect natural resources (including those pertaining to the economy, commerce, agriculture, forestry, energy, industry, etc.);
- Identifying institutions and agencies (both governmental and non-governmental) that create and implement such policies;
- Conducting a qualitative assessment of the impacts of each policy on economic growth and the natural resource base in both the short and long run; and
- Analyzing the interactions of these policies, discussing significant gaps in the current policy set and determining principal policy alternatives for a policy agenda.¹⁰

In terms of the "natural resources scope" of these inventories, five broad subject areas were covered in each:

⁸ APAP II also conducted six field studies focusing on investment policy toward irrigated agriculture.

⁹ This work was conducted under funding provided by the USAID/ROCAP Regional Environmental and Natural Resources Management (RENARM) Project.

¹⁰ From the common preface to all the country inventories.

- Sustainable Agriculture;
- Forest Production;
- Management of Water Resources (including watershed management policies);
- Management of Wildlands and Biodiversity; and
- Management of Coastal and Marine Resources (included under water resources in some inventories).

The inventories themselves employed a fairly standard format across countries that included the following components:

- An overview of the main **natural resource issues**;
- An analysis of the national **policy environment**, including political, economic, and socio-cultural factors (includes asset distribution and access factors as well);
- A description of the main **institutions** and their interactions affecting natural resource use and management (across the subject areas such as sustainable agriculture) and questions of institutional coordination across policy issues;
- An assessment of the key **natural resource policies** (including international and regional agreements, macroeconomic, sectoral, and subsectoral policies; and
- An identification of major areas for **future research**.

The main purpose of this sort of inventory or action plan is to establish a baseline for policy analysis. The natural resource problems and issues in a given country must be first assessed at a general level so that they can be put into some priority ranking. If this has been done, and there is a sufficient degree of national consensus that something should be done about a certain number of natural resource problems, then it is possible to move on to more specific kinds of actions.

2.2. General Approaches to Policy and Sustainability Issues

After the completion of the six country natural resource policy inventories, an APAP II team worked on developing a series of cross-cutting, summary lessons from these experiences. This resulted in a publication in two parts entitled "**The Green Book**". The first part (APAP II No. 406) summarized and analyzed the wide range of policies that directly affect natural resource use in the six countries. The standardized analysis considered the "likely impacts" of making improvements in a given type of agricultural policy (such as the pricing of irrigation water) on output growth, welfare, and resource conservation.

The second part (APAP II No. 407) was a "Manual for Conducting a Natural Resource Policy Inventory" that was based on the lessons from having done this in six countries. Of particular importance were two aspects. One is the approach to the inventory in five steps:

- Problem identification
- Policy Identification
- Institution and Stakeholder Identification
- Policy Assessment (including direct impacts and interactions among policies)
- Identification of Policy Alternatives and Research Priorities

The second important contribution is the authors' insistence on looking at the inventory as a process and one that would be proportionally strengthened (both qualitatively and in terms of political ownership) by encouraging maximum stakeholder participation.

The material in these two volumes has been further developed and substantially revised. The next version of *The Green Book* (in three volumes) will be available from Abt Associates in approximately one month. This revised version is even more focused on the process of conducting an inventory and how the results can be used to construct a participatory action agenda for change.

2.3 Methods: Use of the Policy Analysis Matrix and Cost Benefit Analysis

The third area in which APAP has undertaken work on natural resource sustainability has been in analytical methods. Two papers were written under contract to APAP II in 1991. In the first Corry and Monke explored using the Policy Analysis Matrix (PAM) for evaluation of options concerning policies that affect natural resources utilization (APAP II No. 334).

The heart of the PAM method are commodity-specific, input-output process budgets, generally constructed at the farm level. Two matrices of input and product prices are then elaborated. The first matrix contains current prices paid and received by farmers and marketers (called "private prices"). The second matrix is composed of "social prices" which involve the valuation of input and product prices at their "social value" which may vary from current nominal levels. The input-output relationships in the farm budgets are multiplied by the two sets of prices, allowing the analyst to compare individual profitability with social profitability.

In applications of the PAM to date, the social value has involved correcting current prices to account for potential distortions introduced by subsidies, restrictive marketing and import policies, etc. Analysts have emphasized correcting the valuation of internationally tradable commodities, with the implicit assumption that the international (or world market) price is more appropriate (or less distorted) than the current price. However, it is also possible to alter the current price matrix to more completely represent resource values. This can involve using higher prices for some inputs (eg., irrigation water priced at its real value or fertilizer prices stripped of their subsidies). A second method of changing the results of the PAM analysis is to change

the technologies embodied in the process budgets to ones that use a different input mix or different relationship with the natural resource base to produce a given output.

As in other economic approaches, the key task is the process of deriving alternative values (prices) for inputs and outputs from the production process. When the natural resource base is taken explicitly into consideration the task becomes one of deriving present values that represent the discounted future value of a resource entering into the production process now.

In the second, Pagiola elaborated an approach by which the PAM method could be combined with more standard cost-benefit analysis, again to examine options between pairs of policy choices (APAP II No. 336). These statements of theoretical use of the PAM were followed by an excellent application of the method to assessing the trade-offs in alternative stocking rates for both cattle and wildlife on Zimbabwe ranches (APAP II No. 362). A time dimension (future value of resources) was effectively built into the analysis by replacing some prices with net present values.

In addition, great emphasis has been placed in APAP training work in making the PAM easy to understand, to apply to real world problems, and to explain to non-economist decision-makers. Gotch and colleagues at the Food Research Institute at Stanford University have developed a hands-on, computerized, agricultural and natural resources policy analysis training program (APAP II No. 412) that could be easily modified to treat natural resource sustainability issues. At this point, the PAM can be more easily used than other approaches, such as the more comprehensive "total welfare" approach suggested by Schuh and Archibald (1994). We note with great interest the incorporation of the PAM into the set of analytical tools in the FAO K2 methodology (Maetz, 1994) and its "sustainability module". The challenge for any of these approaches is to move now to more operational testing at the country level.

2.4. Indicators of Sustainability in Past APAP Work

We have seen that APAP's work on natural resource sustainability questions to date has largely been at the inventory/diagnostic stage with some additional work done preparing analytical tools that can easily be adapted to work on real world problems (eg., at the assessment stage). The project, like other organizations, has contributed to a heightened awareness of the importance of agro-ecological sustainability and helped spell out some of the key causal relationships that underlie what are considered to be unsustainable resource use practices in specific countries.

The APAP II natural resource policy inventories, when identifying key problem areas, have identified indicators at the policy and behavioral levels (to use our conceptual framework in Figure 1) which are strongly associated with resource use patterns that have been identified as non-sustainable. The identification of a non-sustainable natural resource use problem, in itself, involves the use of some type of indicator or group of indicators, however "impressionistic" or "seat-of-the-pants", that show that country X's forests are disappearing at an alarming rate or that soils in a given region are now too poor to produce crops formerly grown, etc.

As field projects or activities, sponsored by AID and other donor groups or by concerned stakeholders themselves, increase in number, it is time to focus on specific field situations, like those being monitored by the SANREM project. This implies that some indicators will be made more concrete, will be measured, and will be used to address the success of actions undertaken (for remediation or otherwise).

3. FUTURE DIRECTIONS

3.1. When Indicators are Needed: Serving the Current and Future Needs of APAP Clients and Contributing to an Evolving Methodology

With the exception of having some say over its relatively limited core funding, APAP is a demand-driven project. Its agenda of activities is largely determined by the expressed needs of its primary clients, host country governments and USAID field missions. Thus, in this section we spell out a potential set of activities which may fit the funding priorities of a number of the mission programs or which may be pursued with the project's core funds. There is much work to be done in building more sustainable agroecological and socio-economic systems in countries around the world.

As we indicated above, the first steps in examining the relationship between national policy and the sustainability of local production and resource-use systems, is promote an official awareness of the sustainability issues. Once the national political process has determined its most serious natural resource sustainability problems, efforts to more carefully diagnose and measure critical system interactions can begin. This process has been under way over the past decade as many countries have undertaken resource inventories and produced "environmental profiles", "national conservation strategies", and "environmental action plans" (Turstall and Van der Wanson, 1992). Indicators become important as projects focus on specific problems, either in the design or the implementation of projects.

From a donor point of view, we are at the beginning of the implementation phase. USAID is in the midst of implementing new projects that are concerned with the relationship between national policy and agro-ecological sustainability in Honduras (the PROMESA Project), in the Gambia, and in Madagascar (the KEPEM Project), among others. A number of countries are beginning to implement projects as part of their Environmental Action Plans. Indicators of performance and impact on the natural resource base are critical.

3.2. Options for Future APAP III Work in Policy and Agro-Ecological Sustainability

APAP III, over the next several years, has a number of good opportunities to participate actively in work focused on the relationship between national policy and local sustainability. These will come in the following four areas:

- **Problem Diagnoses and Policy Inventories:** APAP III collaborators are ready to do this kind of work, particularly in countries where this has not been done recently, or where it has not been done in a manner useful to USAID missions and national governments they work with. This would undoubtedly involve use of the new version of *The Green Book*, where the main task involves working with local stakeholders to convert the general statements in the source book (Volume 1) into statements that apply specifically to that country. Our comparative advantage is in the analysis of policy and how policies

affect production and resource use at the field level. There would seem to be good opportunities to undertake this work in several sub-regions in Africa. We would welcome collaboration with technical scientists better equipped to deal with the complexities of physical processes. In some countries there is still substantial need for the use of these exercises as part of overall environmental "consciousness-raising". The Green Book approach has proven to be a very useful participatory approach towards this end. ¹¹

- **Analysis and Modeling Efforts:** Once basic inventories and problem identification have been completed, there are substantial opportunities to work with host country personnel (generally in ministries, universities, or other specialized agencies) to undertake the field research needed to begin to systematically analyze the policy/resource use relationship. The tool that we feel shows particular promise to use initially is the **Policy Analysis Matrix (PAM)** methodology. This will require some supplementary efforts to effectively incorporate "correct" resource pricing (pricing that helps ensure that the next generation of resource users has equivalent access to the resource in question) into the analytical method. We are also eager to work collaboratively with other organizations on this applied research. For example, some of the University partners in APAP III would be good "beta sites" to give the FAO's K2 modeling system rigorous field testing and to assist in the design of improvements. It is critical that this analytical work be done in continual collaboration with scientists and analysts from the host country in order to ensure maximum training of local personnel and development of institutional capabilities.
- **Technical Assistance in Project Design and Implementation:** Through its capability to enter into "buy-in" contracting arrangements with USAID Missions, APAP III personnel are available to assist in the design of projects looking at the policy/resource use relationship. In addition, it can provide short-term assistance to existing projects or special mission efforts to develop measurable indicators of sustainability. For certain problem areas it is vital to develop these indicators and employ them in a base-line assessment so that remediation efforts can be scientifically monitored. There would be two broad subject matter areas where this type of assistance can be undertaken: (a) looking at the relationships between macroeconomic policies and natural resource use in the agricultural sector (example: exchange rate policy reform, changing patterns of crop and livestock profitability, and changing patterns of soil erosion and fertility decline in the CFA countries of West Africa) or (b) looking at a narrower set of relationships between specific agricultural policies and the natural resource base (see the Morocco example above on page 8).
- **Methodologies for Resource Valuation:** As we discussed above, putting resource use questions into an economic analysis framework often involves deriving prices where

¹¹ A computer-based pedagogical tool that also looks to be very promising in terms of environmental consciousness-raising is ECOZONE, a Windows-based environmental training program that focuses on the relationships between national policies and local consequences. This program is in the final stages of development by the Training Section of the FAO Policy Analysis Division of FAO/Rome.

markets are not well established or where they generally fail to adequately capture notions of a discounted value for the future use of that stock of resources. The valuation problem is a complex one, often with technical or scientific dimensions. The likely approach of APAP III would be to undertake a core project of "intelligent borrowing" that would gather and digest this specialized technical work (a very good example is Lal, 1994) and put it in a form more easily accessible to those who have to use it in their explorations of alternative price structures for today's resource use in agricultural production. The resulting product might be a "Natural Resource Valuation Handbook" (geared to economists and other social scientists) to be published in the project's methods and guidelines series.

At the aggregate level, a related national policy question is the explicit incorporation of use rates of renewable and non-renewable resources into national income accounting. Efforts in this direction can certainly help in building greater awareness of the connection between the health of the natural resource base and longer-run national prosperity.

BIBLIOGRAPHY

For ease of reference, this bibliography is divided into two parts: (A.) APAP II Project Documents, listed by report number, and (B.) Other Sources, listed alphabetically.

A. APAP II PROJECT DOCUMENTS DEALING WITH NATIONAL POLICY AND NATURAL RESOURCE ISSUES ¹²

Technical Reports:

- #108. Theresa Bradley, et.al. 1990. *Guatemala Natural Resource Policy Inventory*, (Three Volumes). April.
- #110. Theresa Bradley, et.al. 1990. *Belize Natural Resource Policy Inventory*. October.
- #111. George Johnston, et.al. 1990. *Honduras Natural Resource Policy Inventory*, (Two Volumes). May.
- #112. Theresa Bradley, et.al. 1990. *Costa Rica Natural Resource Policy Inventory*, (Three Volumes). October.
- #113. Ruben D. Nunez, et.al. 1990. *El Salvador Natural Resource Policy Inventory*, (Three Volumes). August.
- #116. D. Gale Johnson, et.al. 1991. *LAC Bureau: Agriculture and Natural Resources Background and Options*. February.
- #128. Ruben D. Nunez. et.al. 1992. *The Dominican Republic Natural Resource Policy Inventory*, (Two Volumes). August.

Collaborative Research Reports:

- #334. Dennis Cory And Eric Monke. 1991. *Using the Policy Analysis Matrix to Address Environmental and Natural Resource Issues*. September.
- #336. Stefano Pagiola. 1991. *Use of Cost Benefit Analysis and the Policy Analysis Matrix to Examine Environmental and Natural Resource Problems*. September.
- #362. Doris Jansen and Carl Gotsch. 1993. *Cattle and Wildlife Ranching in Zimbabwe: An Economic and Ecological Assessment*. September.

¹² These documents may be purchased for the cost of reproduction from the APAP III, Abt Associates, Inc., Suite 600, 4800 Montgomery Lane, Bethesda, MD. 20814. (Tel: 301-913-0500).

#364. Susan Lund. 1993. *The Economics of Forest Policy: Examples from Southeast Asia*. September.

Methods and Guidelines Reports:

#406. George Johnston, et.al. 1992. *The Green Book, Part 1: A Policy Taxonomy and Analysis of Policies Affecting Natural Resources and the Environment*. October.¹³

George Johnston, et.al. 1993. *The Green Book, Part 2: Manual for Conducting a Natural Resource Policy Inventory*. September.

#407. Gary Ender et al. 1993. *Guidelines for Agricultural and Natural Resource Policy Analysis*. March.

#412. Carl H. Gotsch. 1993. *Agricultural and Natural Resources Policy Analysis Course*. September, in seven volumes:

- "Outline and Lecture Notes";
- Volume I: "Learning Spreadsheets and Analyzing Aggregate Data";
- Volume II: "Policy Analysis Matrix (PAM)";
- Volume III: "Natural Resource Policy in a PAM Framework";
- Volume IV: "Agricultural Policy Analysis Using Market Level Models" (written with Leigh Bivings);
- Volume V: "Social Equilibrium Analysis Using Market Level Models" (written by Timothy Josling);
- Volume VI: "Optimization in Agricultural Policy Analysis: Micro-Level Modeling Using GAMS".

B. OTHER SOURCES

Esheverria, Jaime et.al. 1993. *Valuation of Non-Priced Amenities Provided by the Biological Resources within the Monteverde Cloud Forest Preserve, Costa Rica*. Bethesda, MD: Development Alternative Inc. September.

Faeth, Paul (ed.). 1993. *Agricultural Policy and Sustainability: Case Studies from India, Chile, the Philippines and the United States*. Washington, DC: World Resources Institute.

Goodland, Robert. 1993. "An Informal Discussion: The Only True Definition of Environmental Sustainability." Paper prepared for the USAID EPAT/MUCIA Environmental Forum.

¹³ A totally revised and expanded version of the "Green Book" is scheduled to be available from Dr. Johnston at Abt Associates in September, 1994 (preparation of this version is being funded by two USAID projects: the Washington-based DESFIL II project and the Central America regional USAID/ROCAP RENARM project).

- Hart, Robert. 1994. *Summary, Conclusions, and Lessons learned from the SANREM/INFORUM Electronic Conference on Indicators of Sustainability*. Erasmus, PA: Rodale.
- Lal, Rattan. 1994. "Methods and Guidelines for Assessing Sustainable Use of Soil and Water Resources in the Tropics." Soil Management Support Services (USDA and USAID), Department of Agronomy. Columbus, OH: Ohio State University. March.
- Maetz, Materne. 1994. *The use of Indicators for Assessing the Impact of Agricultural Policies on Sustainability: the Example of FAO's K2 Software*. Rome.
- Munasinghe, Mohan. 1993. "Environmental Economics and Sustainable Development", *World Bank Environmental Paper No. 3*. Washington, DC.
- National Research Council. 1993. *Sustainable Agriculture and the Environment in the Humid Tropics*. Washington, DC.
- National Research Council. 1992. *Alternative Agriculture*. Washington DC: National Academy Press.
- Norgaard, Richard B. 1992. "Sustainability and the Economics of Assuring Assets for Future Generations." Policy Research Working Paper No. WPS 832. Washington, DC: The World Bank.
- Panayotou, Theodore. 1989. *The Economics of Environmental Degradation Problems, Causes and Responses*. Cambridge: Harvard Institute for International Development. December.
- Pezzey, John. 1992. "Sustainable Development Concepts: An Economic Analysis", *World Bank Environment Paper No. 2*. Washington, DC.
- Redclift, Michael. 1993. "Sustainable Development: Needs, Values, Rights," *Environmental Values*. 2: 3-20.
- Schuh, Edward and Sandra Archibald. 1994. *A Framework for the Integration of Environmental and Sustainable Development Issues into Agricultural Planning and Policy Analysis in Developing Countries*. Humphrey Institute of Public Affairs. March.
- Srivastava, Jitendra and Harold Alderman. 1993. "Agriculture and Environmental Challenges", *Proceedings of the Thirteenth Agricultural Sector Symposium*. Washington, DC: World Bank.
- Tunstall, Daniel B. and Micke van der Wansem. 1992. *1993 Directory of Country Environmental Studies: An Annotated Bibliography of Environmental and Natural Resource Profiles and Assessments*. Washington, DC: World Resources Institute.

- Tweeten, Luther. 1992. "The Economic of an Environmentally Sound Agriculture (ESA)," *Research in Domestic and International Agribusiness Management*. 10: 39-83.
- Tweeten, Luther. 1993. "Sustainable Agricultural Production," *Guidelines for Agricultural and Natural Policy Resource Analysis*. (APAP II Methods Report No. 407).
- United Nations Conference on Environment and Development. 1992 "Promoting Sustainable Agriculture and Rural Development", Chapter 14 of *Agenda 21*. New York: The United Nations.
- USAID. 1994. "Strategies for Sustainable Development." Washington, DC.
- USAID, Office of Agriculture. 1993. "Project Paper: Agricultural Policy Analysis Project III." Washington, DC.
- World Resources Institute. 1992. *World Resources: 1992-93*. New York: Oxford University Press.
- World Resources Institute. 1994. *World Resources: 1994-1995*. Washington, DC.
- Young, T. and M.P. Burton. 1992. "Agricultural Sustainability: Definition and Implications for Agricultural and Trade Policy," *FAO Economic and Social Development Paper* No. 110. Rome.