ENTER INFORMATION ONLY IF NOT INCLUDED ON COVER OR TITLE PAGE OF DOCUMENT

1. Project/Subproject Number

2. Contract/Grant Number: LAC 0022 C 00 9041 00

3. Publication Date

4. Document Title/Translated Title

PN-ABT-335

5. Author(s)

1.

2.

3.

6. Contributing Organization(s)

7. Pagination: 51

8. Report Number

9. Sponsoring A.I.D. Office: LAC/DR/RD

10. Abstract (optional - 250 word limit)

11. Subject Keywords (optional)

1.

2.

3.

4.

5.

6.

12. Supplementary Notes

13. Submitting Official: Amy Kim Buckner

14. Telephone Number: 202 456-0649

15. Today's Date: 12/7/92

DO NOT write below this line

16. DOCID

17. Document Disposition: DOCRD [ ] INV [ ] DUPLICATE [ ]

AID 590-7 (10/88)

PN-ABT-335

LAC TECH

LATIN AMERICAN AND CARIBBEAN
AGRICULTURE AND RURAL DEVELOPMENT
TECHNICAL SERVICES PROJECT

DRAFT

Getting Agricultural Research, Extension, and Education (Ag REE) on A.I.D.'s Policy Dialogue Agenda: A Concept Paper

SUBMITTED TO:

Division of Rural Development
Office of Development Resources
Bureau for Latin America and the Caribbean
U.S. Agency for International Development
Washington, D.C.

SUBMITTED BY:

Kerry J. Byrnes
LAC TECH Agricultural Research, Extension, and Education Advisor
Chemonics International
Washington, D.C.

July 15, 1991

B

Table of Contents

I. Introduction 1

II. Targeting the Ag REE Sub-Sector 1

III. Opportunity for Market-Led Ag REE Systems 3

IV. An Illustrative Case: Ecuador's Ag REE System 4

A. Research 5
1. Public Sector 5
2. Private Sector 6
B. Education 7
C. Extension 8

V. Inducing a "Demand-Driven" Ag REE System through Non-Project Sector Assistance (NPSA) 9

A. Target Areas for Inducing Institutional Change . . . 10
1. Increasing Private Sector Involvement 10
2. Leveraging Public Sector Institutional Change . . 10

B. NPSA as a Mechanism for Inducing Institutional Change 11
1. Long-Run Program Objective 12
2. Program Components 12
a. Continuing Strong Intermediary Support 12
b. Political Consensus for Autonomy and Budget . 12
c. Program Coordination and Financial Intermediation 13
d. Private Technology Linkage Programs (RELUs) . 13
e. Government Commitment as Condition Precedent . 14
(1) Budget Expansion 14
(2) Autonomy 15
(3) Management 15
(4) Program Focus 16
(5) Substantive Area Balance 17
f. Selective University Strengthening 17
(1) Departmental Strengthening Grants 18
(2) System Diagnostic Study 18
3. NPSA Implementation Plan 19
a. Implementation Process 19
b. Program Input-Output Relationships 20
4. Proposed Program Schedule 20
5. Assumptions 24

C

VI. A Proposed Centrally-Funded AGREE Project to Support Mission-level NPSA Initiatives for Ag REE-Strengthening 26

A. Overview of Project Logical Framework 27
1. Goal 27
2. Purpose 28
3. Outputs 28
a. Short-term 28
b. Medium-term 28
c. Long-term 28
4. Inputs 28

B. General Description of Project Activities 29
1. Research 29
2. Extension 29
3. Education 29

C. Potential Client Organizations 30

E. Mechanism for Implementing Project 30

F. Technical Assistance Component 32

G. Funding Component 32

H. Location of Project Office 33

I. Potential Experience to be Transferred/Applied Through Project 35
1. Marketing 35
2. Research 35
3. Extension 35
4. Education 36

Annex A-1. "Demand-Driven" Ag REE Systems 37

A. A "Demand-Driven" Ag REE System 37
1. Need for "Demand-Driven" Agricultural TG&T . . . 37
2. Conditions for a "Demand-Driven" Ag REE System . 41
3. Functions of a "Demand-Driven" Ag REE System . . 46
a. Research 46
(1) Public Sector Research 46
(2) Private Sector Research 47
(3) Academic Research 47
b. Extension 47
c. Education 48

B. Implications for a Demand-Driven Ag REE System . . . 48

References 50

D

List of Boxes

Box 1. Generic List of Agricultural Research, Extension, and Education Organizations in the LAC Region. 31

Box A-1. The Rise and Fall of a Supply-Driven Concept of TG&T in the LAC Region. 38

List of Tables

Table 1. Illustrative NPSA Program Input-Output Relationships for Ecuador. 21

Table 2. Task Schedule for Proposed USAID/Ecuador NPSA Program to Strengthen Ecuador's Ag REE System . . 22

Table 3. An Illustrative Budget for an Ag REE-Strengthening NPSA Program for Ecuador. 23

Table 4. Key Program Components of the NPSA Model for Strengthening a Country's Ag REE System. 25

Table A.1. Typology of Producers for Defining a Client-Oriented TG&T Strategy. 45

List of Figures

Figure 1. A Matrix of Possibilities for Locating Project Office for the AGREE Technical Support Project. . 34

List of Annexes

Annex A-1. "Demand-Driven" Ag REE Systems. 37

E

I. Introduction

The objective of this concept paper is to assist the U.S. Agency for International Development (A.I.D.), specifically, the Latin American and Caribbean (LAC) Bureau and Missions, in identifying a set of guidelines for getting the issue of agricultural research, extension, and education (Ag REE) strengthening (e.g., greater autonomy and budget support for agricultural research) on the policy dialogue agenda in A.I.D.-assisted LAC countries.

To this end, Section II reviews the need for the LAC Bureau's Agriculture and Natural Resources (ANR) strategy to target or set priorities for REE-strengthening.

Section III outlines the opportunity for the LAC Bureau and Missions, by getting the Ag REE-strengthening issue on the policy dialogue agenda in A.I.D.-assisted LAC countries, to play a role in fostering the emergence of "market-led" or "demand-driven" Ag REE systems (see Annex A) in the LAC region.

In Sections IV and V, the paper examines the question of how to get Ag REE-strengthening on the policy dialogue agenda. Section IV, in providing background on an illustrative LAC Ag REE system (Ecuador), defines the problematic context that most LAC Missions would face in trying to get Ag REE-strengthening on the policy dialogue agenda.

Section V presents a model of a process that could be followed to get Ag REE-strengthening on the policy dialogue agenda. This model illustrates non-project sector assistance (NPSA) as a vehicle for getting Ag REE-strengthening on the policy dialogue agenda. Ecuador is used to illustrate the model's components, recognizing that this model has not yet been applied in any of the A.I.D.-assisted LAC countries, Ecuador included, and likely would need to be adapted to meet each country's circumstances.

Finally, Section VI identifies a centrally-funded Agricultural Research, Extension, and Education (AGREE) Technical Support Project to assist LAC Missions in designing a NPSA program to strengthen Ag REE.

II. Targeting the Ag REE Sub-Sector

The draft proposed Agriculture and Natural Resources (ANR) Strategy of A.I.D.'s LAC Bureau identifies a targeted set of actions aimed at attaining broadly-based sustainable economic growth. Pursuant to this primary economic growth objective, specific needed actions are identified for each of the strategy's four sub-objectives. These sub-objectives are:

- Encourage the adoption of and continued adherence to economic policies that promote investment, productive employment, and export-led economic diversification;

- Encourage a vigorous response by the private sector to a favorable policy environment;

- Encourage accelerated opportunities for increased participation in the economy by the historically disadvantaged; and

- Encourage preservation and sustinable use of the natural resource base.

Also, the strategy recognizes that, in most A.I.D.-assisted LAC countries, agricultural sector performance (i.e., sustainable productivity) will continue, for many years, to be a key factor in determining the pace at which a country is able to attain broadly-based and sustainable economic growth.

To further progress toward encouraging the private sector to respond vigorously to a favorable policy environment, the strategy calls for a set of needed actions, at least four of which are directly or indirectly related to strengthening agricultural research, extension, and education (Ag REE), as follows:

- Encourage complementary reforms in agri-support markets (e.g., financial, land, labor, commercial, and technology) and in the government civil service;

- Support research and technology development and transfer programs that will increase agricultural productivity, involving selected private and public sector institutions;

- Support and strengthen selected private/public institutions that provide quality education and training in agriculture and natural resources; and

- Strengthen private sector organizations that provide services to the agricultural sector (e.g., research and technology transfer).

While such strategy statements reflect a recognized need for A.I.D. to provide assistance for Ag REE-strengthening in the LAC region, there is a growing awareness that A.I.D. needs to find new and more effective ways to provide this assistance. A.I.D. has helped strengthen Ag REE systems in the LAC region since the early 1950s. Despite success in building public AG REE institutions between the 1950s and 1970s, the region's technology generation and transfer (TG&T) capacity deteriorated significantly during the 1980s, weakening agriculture's capacity to contribute to food security, trade, and economic growth (Byrnes, 1991).

III. Opportunity for Market-Led Ag REE Systems

Now, as the economic performance of A.I.D.-assisted countries is beginning to improve, and to increase the likelihood of sustaining economic growth, there is a need to reverse the trend toward deterioration of the region's TG&T capacity. Key to reversing this trend is creation or fostering of a "demand-driven" (market-led) TG&T process. Emergence of a market-led Ag REE system will depend on meeting three requirements:

1. Establishment of a macroeconomic and sectoral policy environment that provides an incentive for investment in the supply of and use of productivity-increasing technologies;

2. Leveraging public sector institutional change (i.e., autonomy of and adequate budget support for the public sector agricultural research organization); and

3. Increased private sector involvement in designing, implementing, and evaluating the TG&T activities of public or private Ag REE organizations engaged in TG&T (e.g., increased farmer participation in identifying research problems, setting research agendas, and allocating research resources).

Further, TG&T organizations must develop program selection criteria that include, *inter alia*, the anticipated market environment and expected costs and benefits of program alternatives, the relative importance of crops, the specific needs and abilities of client groups; and the specific mix of public and private funding that is required for sustaining Ag REE systems.

While not every A.I.D.-assisted LAC country needs an all-inclusive Ag REE system (e.g., equivalent to a land grant-type university), each country does need, at minimum, a capability for coordinated provision of those Ag REE functions essential if the country is to develop a self-sustaining capacity to reach out for, access, and adapt technologies required to compete effectively in an interdependent global market. What, if anything, can A.I.D. do to foster the emergence of "market-led" Ag REE systems in the LAC region? As identified in the Ag REE Inventory (Byrnes, 1991), potential assistance options for fostering emergence of demand-driven Ag REE systems include:

- Setting priorities for Ag REE in the LAC Bureau's Agriculture and Natural Resources strategy;

- Organizing assistance programming for Ag REE-strengthening in terms of sub-regional programs;

- Ensuring balanced A.I.D. support for international, regional, and national agricultural research systems;

- Providing appropriate technical support through existing or new projects or funding mechanisms; and

- Reorienting existing and planned projects to focus on Ag REE-strengthening and to adhere to A.I.D. guidelines for Ag REE-strengthening.

One of the key guidelines for Ag REE-strengthening identified in the Ag REE Inventory is for the LAC Bureau and Missions to get the issue of Ag-REE strengthening on the policy dialogue agenda in A.I.D.-assisted LAC countries. While a Mission may concur that Ag REE-strengthening should be included in the Mission's policy dialogue agenda with the host country government, the Mission may have reservations regarding how this issue can best be addressed as a component of the Mission's ongoing policy dialogue. Indeed, the LAC Bureau currently has no established guidelines on how the LAC Missions could most productively carry forth policy dialogue that includes Ag REE-strengthening as a part of the agenda.

IV. An Illustrative Case: Ecuador's Ag REE System[1]

Each country must provide for coordinated provision of the research, extension, and education functions that are essential for developing and maintaining a productive, competitive, and sustainable agriculture. But each country must define and work out its own best way to organize and coordinate the provision of these functions by public and private sector organizations. This section looks at a specific country as a basis for identifying an approach that potentially could be applied, appropriately modified, to getting Ag REE-strengthening in other A.I.D.-assisted LAC countries. The case examined is Ecuador's Ag REE system.

A.I.D. has assisted in the development of a science-based agricultural technology system in Ecuador since World War II, when the Pichilingue research station was established. A.I.D. subsequently provided technical assistance and other resources to help develop Ag REE facilities and services. But U.S. assistance provided in Ecuador, as elsewhere, has been varied and discontinuous, just as has Ecuadorean public and private sector support for the Ag REE system. As a result, there have been periods when the country's Ag REE institutions were hemispheric models, followed by periods of stagnation and decline. However, just as no nation's agriculture can prosper without competitive technology, no nation can achieve this objective without a sustainable system to develop and adapt technology to its unique ecological conditions and cultural practices.

---

[1]This case example draws heavily on a concept paper prepared by Scaff Brown (1990c).

The decline in inflation-adjusted revenues that followed a rapid growth of public sector services in the 1970s led to continued budgetary constraints in the 1980s. One result was that the public component of the Ag REE system was affected as severely as other Government of Ecuador (GOE) agencies. For example, the budget of the public research organization (INIAP) declined, on an inflation-adjusted basis, from .85% of agricultural GDP in 1980 to .17% in 1989. It is believed that agricultural extension and education suffered as much or more.

A. Research

1. Public Sector

In the late 1970s, INIAP was a premier Latin American research organization; in the early 1990s it is struggling to survive and maintain a positive contribution to development of the agricultural sector. As Venezian and Mocada (1989) have noted:

> The weakness of INIAP is caused fundamentally by the drastic reduction of its budget in the last eight years, which was not accompanied by equivalent adjustments in the size of its programs and the number of personnel; this has resulted in low remuneration and scarcity of operational resources, with the consequent loss of the best qualified investigators, and the loss of drive and corporate spirit of the institution (translated from Spanish).

The unsuccessful struggle to adjust to a continuous decline in financial support during the 1980s drained away managerial as well as scientific talent, and drastically reduced scientific output and reputation. The decline of INIAP was exacerbated by political interference in the institute's operations, and by the rigidities of a civil service system that prevented providing competitive remuneration to government employees.

INIAP, despite this disheartening condition, retains the same physical resources (somewhat deteriorated, to be sure), the same basic institutional structure, and a scientific staff of some 200 professionals, about one-fourth with the M.S. degree. However, INIAP's staff lacks senior scientific leadership, is responsible for a plethora of programs covering 70 commodities, and is dispersed throughout Ecuador, with an extremely low level of operating support. Yet INIAP still retains the potential to respond to better leadership, adequate financial resources, and liberty to adjust programs, personnel and facilities.

2. Private Sector

INIAP's deterioration led USAID/Ecuador to seek private sector alternatives for improving Ecuadorean TG&T. The Rural Technology Transfer Systems (RTTS) project linked Ecuadorean commodity associations (dairy cattle, sheep, short cycle crops, and beef cattle) with the international scientific community via contracts with the University of Florida and Utah State University. This generally successful experience assessed limiting commodity production constraints, introduced and tested corrective technology on association member farms, and extended the results to association members and other farmers. This approach to linking farmers, research, and extension came to be known as the Research Extension Linkage Unit (RELU) model.

But while RTTS was generally successful, the project was not self-sustaining; nor did it use INIAP's capability or generate support for INIAP's revival. Such support would be essential to ensure the conduct of research in geographic areas and on crops where the private sector does not have an incentive, or perceives the risk to be too great, to invest in research. In the face of this situation, USAID/Ecuador opted to create a private, non-profit foundation (FUNDAGRO), sustainable through an endowment and donor, private sector, and public sector contributions.

FUNDAGRO was established in March 1988, with a $7M, 5-year program, a $2M equivalent local currency endowment, and a mandate to finance and supervise programs applying the RELU concept. The foundation also was to make more effective use of superior Ecuadorean professionals underutilized by INIAP and the universities. Further, under a board representing leading farmers and ranchers, FUNDAGRO was to spearhead development of a national constituency for science-based agriculture.

In a little more than two years, FUNDAGRO had met the USAID/Ecuador conditions precedent and put in place an effective operating organization with major technology programs in coffee, dairy, yuca, and minor efforts in other commodities, primarily non-traditional agricultural export (NTAE) crops. These programs include both research and extension, and involve producers organizations, university investigators and students, INIAP, and international links. FUNDAGRO also has established sound financial and program control systems, and become a leading force in generating national support for scientific agriculture. To date, the foundation has obtained more than $1M in support for its programs from other donors.

Now the Ecuadorean private sector is well-organized. Farmer participation is required in the Centros Agrícolas Cantonales and through them in four regional Cámaras de Agricultura and in a national Cámara de Agricultura. Many commodity-oriented producers associations perform representational and technological functions. Several of these were involved in the RTTS program, and others are participants in current FUNDAGRO-led activities. Several other associations and firms perform research and provide technical assistance, including Central Ecuatoriana de Servicios Agrícolas (CESA), Centro Andino de Acción Popular (CAAP), ANCUPA (African oil palm), OLEICA (sunflowers), PRONACA (hybrid corn, sorghum), and LATINRECO (a Nestle subsidiary interested in Andean and tropical crops). Their work is generally narrowly focused on their own interests, and usually not communicated to the public.

B. Education

Donors including USAID/Ecuador have had little involvement with Ecuador's university system; thus, little concrete information is available on the country's education system. Universities have been somewhat xenophobic, particularly as regards intervention by U.S. Government agencies. However, it is known that the tremendous expansion in higher education, including agricultural education, in the late 1970s created sixteen Faculties of Agriculture in more than a dozen universities and technical schools. This education is free to students, but admission standards are lax. The resulting demand for education outstripped both facilities and adequately prepared faculty. Much of the faculty is part-time, underqualified, and "inbred" academically. With no national graduate training, many faculty members have no better education than that which they provide their students.

The universities, completely autonomous from the GOE, act independently from each other. This autonomy and the opportunity for faculty to supplement incomes with non-academic work enables the universities to attract some staff with good qualifications. But they are squeezed, on the one hand, by limited budgets and large student bodies and, on the other, by the limited supply of professionals with graduate degrees. Few professors do research, and that required of students is of dubious quality, with little advancement of knowledge or improvement of technology. There is little provision in the budget for research or extension and no guidelines, but there are sources of individual research grants, and some recognition the value of research. FUNDAGRO has been able to incorporate into its programs research by selected professors in some better-equipped university departments.

Despite these problems, the university outlook is uneven and undergoing change. Several schools have an acceptable infrastructure (laboratories, libraries, experimental fields), and some tradition of faculty research. Examples include the Universidad Central del Ecuador (UCE), Universidad Estatal de Guayaquil, Escuela Superior Politécnica de Chimborazo (ESPOCH), Universidad Técnica de Babahoyo (UTB), Universidad Técnica de Manabí, Universidad Nacional de Loja, and Escuela Politécnica de Machala. There is growing support for research from local sources as well as from FUNDAGRO, the National Council of Universities and Polytechnic Schools (CONUEP), and international donors. Some universities have expressed an encouraging attitude towards direct USAID assistance.

C. Extension

Technology transfer is an important part of a country's strategy for coordinating the provision of the REE functions, but development of formal agricultural extension institutions is not a USAID/Ecuador priority at this time. The Mission is more concerned that research results are made available by the investigators in a readily accessible form to all concerned technology transfer agents than in trying to strengthen the organizations that employ them.

Public sector agricultural extension in Ecuador is a legacy of former USAID assistance. But like INIAP and for many of the same reasons, public sector extension is in disarray, with many extension activities dispersed in various Ministry of Agriculture (MAG) departments. MAG extension is being assisted under the Inter-American Development Bank (BID)-financed PROTECA program.

Private sector and PVO/NGO agricultural extension activities are narrowly focused, in the first instance on commodities, in the second, on geographic areas. FUNDAGRO provides considerable support to extension in its RELU activities.

V. Inducing a "Demand-Driven" Ag REE System through Non-Project Sector Assistance (NPSA)

What role can a USAID Mission play in assisting the host country to develop the essential conditions for a client-oriented, demand-driven, and market-led Ag REE system? Based on the previous analysis of Ecuador's REE system, Brown (1990c) proposed non-project sector assistance (NPSA) as "a pragmatic, flexible approach" to targeting assistance to strengthen Ecuador's REE system. A.I.D.'s traditional development assistance approach, Brown observed, has been to support bilateral projects aimed at starting activities and programs that host country governments subsequently are unwilling or unable to sustain, or to provide cash transfers in exchange for macroeconomic policy reforms that are not targeted on the more specific needs of a particular sector (e.g., agriculture) or sub-sector (e.g., Ag REE system). However, the NPSA strategy, as applied to the Ag REE sub-sector of an economy's agricultural sector, would support policy dialogue aimed at building a constituency (creating a demand) for establishment and support of a productive, sustainable Ag REE system.

With notable exceptions, Ecuador's current Ag REE system is in disarray following a decade of financial constraint, bordering on crisis, the result of overinvestment in bureaucracy during a period of unusually great government revenues. Advancement of system performance, with exceptions, is limited by a mix of archaic laws, policies, attitudes, traditional management, and political interference, all constraints characteristic of public sector agricultural institutions in most A.I.D.-assisted countries. Yet, in Ecuador, there are strongly favorable signs that auger well for the future of the country's Ag REE system. The country already is developing a macroeconomic and sectoral policy environment that provides an incentive for investment in agriculture through investment in and use of productive technology. Further, the country already has experience in encouraging farmer participation in identifying research problems, setting research agendas, and allocating research resources. In turn, the emergence of a "market-led" Ag REE system will depend on:

- Increased private sector involvement in designing, implementing, and evaluating the TG&T activities of Ag REE organizations; and

- Leveraging public sector institutional change (autonomy of and adequate budget support for the public sector agricultural research organization).

A. Target Areas for Inducing Institutional Change

The emergence of a demand-driven Ag REE system in Ecuador will depend, in large measure, on establishing the two aforementioned conditions: (a) increased private sector involvement; and (b) leveraging of institutional change in the public sector.

1. Increasing Private Sector Involvement

FUNDAGRO's success in designing and implementing commodity-focused research and extension, involving university and INIAP professionals as well as private sector organizations, provided FUNDAGRO with strong credentials as a scientific leader capable of building a constituency for science-based agriculture. The involvement of the private sector, through the participation of producer organizations in the process of establishing FUNDAGRO, likely was a key factor in beginning to turn A.I.D.'s traditional "supply-oriented" approach to strengthening Ag REE institutions into a modern "market-oriented" approach to creating a demand-driven Ag REE system, that is, a system more responsive to client farmers' agricultural technology needs.

2. Leveraging Public Sector Institutional Change

Following these developments, Ecuador's current Minister of Agriculture and Subsecretary contracted the drafting of a law granting INIAP full autonomy. This law, discussed favorably at high levels of the GOE, awaits submission to the Legislative Assembly. Further, Ecuador's President demonstrated the GOE's concern for financing INIAP by transferring to it a fund accumulated for the now-defunct International Coffee Organization. The increase in the price of crude oil attendant on uncertainties in the Middle East may enable the GOE to increase INIAP's budget. Finally, some university faculty and departments are demonstrably open to research and to welcoming USAID/Ecuador assistance in developing research.

These developments suggest that FUNDAGRO's initial success as a more demand-driven TG&T system served to demonstrate FUNDAGRO's potential value to Ecuador. FUNDAGRO, by providing technological solutions to production constraints, improved its ability to command not only greater respect but also a greater allocation of public and private resources to support the foundation's agricultural TG&T program.

In light of this favorable environment, Brown (1990c) proposed that a USAID/ Ecuador commitment to support specific activities, dependent on GOE achievement of specific conditions, might encourage the difficult political process involved in achieving the establishment of those conditions. Brown also noted that the time may be propitious to take advantage of the opportunity to initiate closer involvement with the university system, which might lead to an improvement in educational quality, needed not only for a science-based agriculture but also for the development and management of a demand-driven Ag REE system.

At this time, one cannot predict the outcome of the proposal to establish INIAP's autonomy or consistent growth in public sector support for INIAP's budget, much less how rapidly the quality of the university system could be improved. There are clear indications that FUNDAGRO is carrying out its mandate. While FUNDAGRO will not be self-sustaining by the end of the current USAID project supporting it, Brown (1990c) indicated that the foundation should be able to take on and manage additional activities well before that project's end. As a basis for continued development of a demand-driven Ag REE system, Brown proposed that the Mission implement a non-project sector assistance (NPSA) program, assuming that the GOE will meet the conditions precedent (CPs) for INIAP and that arrangements can be made to involve selected university departments.

The following is a review of the proposed Ag REE-strengthening program for USAID/Ecuador. It is emphasized that, as of the writing of this section, the validity of the program remains untested, since the Mission has not yet made a decision to implement the program. Thus, the following is a conceptual model of NPSA as it might be applied in a specific country case. NPSA as a sub-sector strategy has not yet been "proven," but the concept merits consideration in view of the deteriorated TG&T capacity of public Ag REE systems in most A.I.D.-assisted LAC countries. NPSA is potentially a tool that, appropriately applied, could prove to be useful in solving this problem.

B. NPSA as a Mechanism for Inducing Institutional Change

A USAID/Ecuador NPSA program for Ag REE-strengthening would entail a commitment by the Mission to a five-year program (plus a preparatory year). During the duration of the NPSA program, the Mission would provide support for FUNDAGRO to exercise a number of intermediary roles, including those of program participant, financial agent, and program monitor.

Mission-provided NPSA funding, as available, would be obligated on a yearly basis, according to specific initial conditions and performance against annual benchmarks. The benchmarks would be negotiated on the basis of program work plans drawn up by a mix of implementing agencies, with FUNDAGRO assistance, reviewed, and approved by the Mission. In the event that one of the other implementing institutions fails to meet the conditions governing direct assistance, FUNDAGRO would be authorized to undertake a moderate expansion of its RELU activities. But even under such expansion, FUNDAGRO would continue, on a selective basis, to draw on the available talents and facilities of INIAP and university departments to implement the RELU programs. This would ensure a continued public-private-university program linkage until developing constituency pressure effects the necessary changes.

1. Long-Run Program Objective

As defined by Brown, the NPSA program's goal program is to expand income of the rural poor majority and increase food production and consumption, while maintaining and enhancing the natural resource base. The purpose of the NPSA program is to establish a sustainable, cost-effective system for providing Ecuadorean agriculture with the productive technology needed to achieve or maintain comparative advantage in the provision of food, industrial raw materials, foreign exchange, employment, income and wealth, and revenues.

2. Program Components

The NPSA program would include the following components:

a. Continuing Strong Intermediary Support

The NPSA program requires continuing support of a strong intermediary which, in Ecuador, is FUNDAGRO. As the key intermediary, FUNDAGRO would serve as program coordinator and financial agent, while expanding its own TG&T programs and building political consensus on (demand for) an effective Ag REE system to carry out demand-driven TG&T. FUNDAGRO, to support the program, would manage a comprehensive training program for all agencies.

b. Political Consensus for Autonomy and Budget

The NPSA program requires that the intermediary play an active role in building political consensus to obtain autonomous status and a larger budget for the public sector agricultural research organization (PSARO) (e.g, INIAP). In other words, this requires that FUNDAGRO work with public leaders and influential agriculturists to build a constituency base of political support for obtaining autonomous status and a larger budget for INIAP. Also, FUNDAGRO would work with selected universities to determine needs and opportunities for strengthening selected departments.

c. Program Coordination and Financial Intermediation

The NPSA program requires ongoing program coordination and financial intermediation. As agreement on the autonomy and budget issues nears, the designated intermediary (FUNDAGRO) would assemble and act as secretariat to an implementing commission (PSARO scientists and managers, government officials, leading agriculturists, and farmer representatives) The commission's objective would be to ensure that the autonomous PSARO, once established, would have the requisite management leadership, program priorities, and operating systems to ensure public trust and a sound program. The criteria generated by this commission would govern development of the PSARO's program and management systems.

FUNDAGRO would draw on its experience to help INIAP develop a medium- term strategy (to bring its program into line with its resources) and a first year work plan; this would include meeting intermediate targets as a condition for successive releases of funds. Once the CPs had been met by the GOE and the strategy and work plans approved by USAID/Ecuador, the Mission would transfer funds to FUNDAGRO for release to INIAP. FUNDAGRO then would monitor progress and arrange for any further assistance that may be needed by INIAP to be able to comply with its strategy and annual plan. Further, FUNDAGRO would analyze INIAP's reports and inform USAID/Ecuador of INIAP's progress, recommending, as the case may be, either release or withholding of funds, based on INIAP's performance. FUNDAGRO would perform a similar but less intense role with university departments (see below).

d. Private Technology Linkage Programs (RELUs)

The NPSA program requires establishing private technology linkage programs (RELUs). During the process described above, the intermediary organization (FUNDAGRO), in collaboration with the implementing commission consisting of scientists and managers of the PSARO (INIAP), government (GOE) officials, leading agriculturists, and representatives of farmer organizations, would continue to operate its own research-extension linkage programs, expanding these to other geographic areas and crops depending on market demand and availability of NPSA program funding. If the PSARO (INIAP) is unable to meet the initial CPs in the near term, then the intermediary (FUNDAGRO) could, with A.I.D. concurrence, use NPSA program funds to expand its own research program or to direct those additional resources to other private or public organizations having a mandate and the capability to carry out agricultural research. Otherwise, the allocation of scarce funds to actual or potential research organizations would be considered only as complementing, not substituting for, an effective but autonomous PSARO. Given limited resources, expansion of FUNDAGRO's programs would need to be supported by funding from other donors or sources such as contracts with private firms.

e. Government Commitment as Condition Precedent

An Ag REE-strengthening NPSA program requires seeking, as a condition precedent (CP), government commitment to address budget and autonomy constraints. In the Ecuadorean case, any commitment of USAID/Ecuador funds for a program of support to revitalize the PSARO (i.e., INIAP) would require that the GOE commit firmly to certain CPs. Two constraints to PSARO revitalization are beyond internal control of A.I.D and so limiting that a Mission should not agree to provide any direct assistance to a country's PSARO until these CPs are resolved satisfactorily. These constraints primarily are budget expansion and autonomy, although there also are constraints in such areas as management, program focus, and substantive area balance.

(1) Budget Expansion

Typically, in most A.I.D.-assisted LAC countries, the PSARO has experienced a continuously declining budget in real terms. In Ecuador, INIAP's budget has shrunk to less than 0.2% of Agricultural GDP, leaving Ecuador with an ineffective public sector agricultural research capability. NPSA responds to this problem by requiring that a durable government commitment be negotiated to raise the PSARO budget in real terms by a designated amount (e.g., at least 20% per year) until the budget for the PSARO reaches a designated level (e.g., 1% of Ag GDP). If an acceptable commitment is made, the USAID Mission would contribute a declining percentage over a five-year period (e.g., 25-20-15-10-5-0 percent of INIAP's initial budget), in order to front load the recovery and revitalization process for the PSARO.

Of course, a number of issues would need to be addressed to adapt NPSA to a country's specific situation. In Ecuador, key issues include:

- What would be considered a durable commitment?
- At projected Ag GDP growth rates, how long would it take INIAP's budget to reach 1% of Ag GDP with annual budget increases of 20%?
- What would such commitment cost USAID/Ecuador and would the probable Mission budget support such a commitment?

(2) Autonomy

Typically, in most A.I.D.-assisted LAC countries, the PSARO (e.g., INIAP) is unable to recruit and keep the highly-qualified scientists needed to lead and manage research. In addition to the budget expansion constraint described above, and the management problem described below, civil service regulations typically prevent the PSARO from paying competitive salaries, while political interference in the organization's personnel and program decisions obstructs, if not precludes, objectivity. The proposed NPSA concept responds to this problem by requiring that a host country government establish the PSARO as an autonomous public sector entity with full control over salaries, assignments, and other personnel matters and program decisions.

Of course, in each country situation, a number of issues would need to be addressed in order to fine tune and adapt the NPSA concept to the country's particular situation. For example, in Ecuador, key issues would include:

- What governing arrangements would ensure selection of excellent senior officers in INIAP, or their removal in event of mis- or malfeasance?
- What financial oversight would be required in order to satisfy responsibility in the use of public funds?
- What program oversight would ensure that criteria used in program selection are both in the public interest and properly applied?

(3) Management

With respect to the management constraint, the typical PSARO in A.I.D.-assisted LAC countries is not cost-effective. In part, this stems from budget and personnel problems. In large measure, however, the problem is because of ineffective management of the resources received by the organization. Several of the key management-related problems noted in INIAP also are typical of PSAROs in other A.I.D.-assisted LAC countries, as follows:

- INIAP is overstaffed with poor-quality scientists and technicians who are poorly supported. Personnel costs make up close to 90% of INIAP's budget vs. 10% for operating costs.
- INIAP maintains properties in excess of need, at significant costs, and performs commercial operations the tangible and intangible costs of which interfere with the institute's primary research mission.

- INIAP's research program is not focused, without priorities, and not evaluated. Internal procedures are inadequate to establish criteria for program design, approval, control, evaluation, and termination.

NPSA responds to the management constraint by requiring that the host country government contract an in-depth review of the management systems of the PSARO, with follow-up systems design and training for implementation, with particular reference to:

- Installation of a Program Planning Budgeting System (PPBS) for setting priorities and authorizing research activities, with effective accounting, monitoring, management information, and evaluation systems.

- Installation of effective personnel controls, including job qualifications and position descriptions, peer review of performance, and maintenance of personnel:operating cost ratios no greater than 70:30.

- Privatization of commercial operations and the closing, sale, or lease of properties that are in excess of need.

The NPSA concept requires that USAID finance this diagnostic study upon adoption by the GOE of the joint commission's recommendations and acceptance of INIAP's long-term strategy to conform programs and resources. Further, the Mission would finance subsequent systems design work and staff training for implementation, upon government acceptance of the diagnosis and agreement to implement the systems. Key issues in Ecuador include: How can the GOE and USAID/Ecuador be assured that the recommendations of such a study will be adopted and, if adopted, applied?

(4) Program Focus

With respect to the constraint of a complex, diverse program focus, the research programs of the typical PSARO in A.I.D.-assisted LAC countries are dispersed and unfocused, dealing with large numbers of commodities in widely scattered locations (research stations). In Ecuador, INIAP is working on some 70 commodities in multiple locations. The NPSA concept responds to this situation by requiring that the PSARO develop a set of program selection criteria that should include *inter alia*:

- The anticipated market environment and expected cost/benefit of program alternatives;

- The relative importance of crops within and across commodity groups, (e.g., basic food crops vs. NTAE crops); and

- The specific needs and capabilities of client groups (e.g., small traditional vs. medium-to-large mechanized farmers).

Key issues identified in Ecuador include:

- What arrangements for developing these criteria can ensure that the criteria reflect good science, producer and consumer welfare, and national development needs?

- How can the criteria be applied to selection or rejection of activities and their subsequent evaluation?

(5) Substantive Area Balance

With respect to the constraint of substantive area balance, the problems of weak priority setting and management characterizing the typical PSARO in A.I.D.-assisted LAC countries are compounded by research approaches heavily oriented to production and weak in the social sciences and natural resources. The social sciences are extremely important in establishing valid criteria for setting agricultural research priorities and for evaluating results. Natural resource management is increasingly being recognized as essential to developing, implementing, and managing sustainable agricultural systems. NPSA responds to this constraint by giving a high priority to incorporating the social sciences and natural resource science into a PSARO's programs.

Key issues identified in Ecuador include:

- Will adding new disciplines place additional stress on an organization that must reduce costs, as this would entail increased costs and/or eliminating/reducing activities?

- When should such an addition be implemented, what preplanning is required, and can suitably-qualified staff be found?

f. Selective University Strengthening

A potential component of an Ag REE-strengthening NPSA program is selective strengthening of one or more universities in the Mission's host country. In most A.I.D.-assisted LAC countries, there are majorconstraints to qualitative improvement in agricultural higher education. In Ecuador, the factors that led to physical growth, free education, and lax standards generated underqualified faculty and students. This system eventually will reform itself, but change likely will be slow and uneven, with progress measured in decades, not years. In the meantime, A.I.D. can and should support improvements when opportunities arise, but should not expect major system changes from its efforts. But minor contributions, concentrated in selected departments, can have an impact on the quality of the output of these departments.

There is growing evidence that selected departments in some universities have the interest, capacity, and facilities to perform effective agricultural research (Hansen, 1989). Also, these departments are capable of and willing to improve their educational offerings by providing better guidance and more experience in supervised research and extension. In the case of Ecuador, observers report a less xenophobic attitude toward U.S. Government assistance, in accord with relaxing international tensions world-wide. These manifestations provide a timely opportunity to strengthen agricultural education while learning more about the general cultural, legal, administrative, and financial characteristics of the system. Following this course, A.I.D. would be better prepared to respond to future opportunities to assist in strengthening agricultural education.

To support the development of the agricultural higher education system as an integral part of a country's Ag REE system, NPSA could provide financing of two components: Departmental Strengthening Grants and a Diagnostic Study of the Agricultural Higher Education System.

(1) Departmental Strengthening Grants

A **Departmental Strengthening Grant** provides annual grants ($20,000 to $50,000) to a number of departments in several universities. Assuming a total of eight departments ($40,000 each), the total annual cost of a Departmental Strengthening Grant program would be $320,000. In Ecuador, the program would take advantage of FUNDAGRO's established relationships with the selected university departments, broadening and deepening these relationships to include departmental improvements, rather than grants to individual staff. Assistance could be diverse, ranging from training to equipment, seminar support to laboratory rennovation. In any year, the precise content would be determined by needs defined by the department, with priorities being set with the guidance of FUNDAGRO to fit within a modest annual grant. The sole criteria would be the contribution to strengthening the department's academic and scientific quality.

(2) System Diagnostic Study

An agricultural higher education **System Diagnostic Study** would entail a detailed survey to provide, for each of the university institutions, a quantitative knowledge base and description of the institution's laws, finances, organizational structure, faculty and student body characteristics, intellectual and physical resources, governing methods, administrative procedures, and any other relevant characteristics. The survey would be conducted by an Ecuadorean firm and presented without conclusions or recommendations, the objective being to gain understanding, not judge, the system.

3. NPSA Implementation Plan

Each country situation would require the preparation of an NPSA implementation plan tailored to the country's situation. For Ecuador, Brown proposed a 5-year NPSA program that would have a total financing of an equivalent of US $12.5 million, consisting of annual contributions averaging $2.5M ($1.0M DA, $1.5M LC). These resources would finance programs with the implementing intermediary (i.e., FUNDAGRO), the PSARO (i.e., INIAP), and up to eight departments of selected universities. As earlier noted, FUNDAGRO's role would be to serve as the key intermediary, acting as financial agent and providing program control of INIAP and university programs, as well as serving as an implementor of its own programs. An NPSA Implementation Plan should include a statement describing the proposed implementation process, program input-output relationships, and program schedule.

a. Implementation Process

For the Ecuador case, Brown proposed that FUNDAGRO serve in several roles, including intermediary in implementing the NPSA process, program participant, financial agent, and program monitor. According to the proposal, USAID/Ecuador would make a commitment for a five-year program, with funding, as available, obligated each year, in response to specific initial conditions precedent and subsequent performance against annual benchmarks. Such benchmarks would be negotiated on the basis of program work plans drawn up by the implementing agencies with the intermediary's (FUNDAGRO's) assistance and approved in Mission review. In the event that one of the other implementing institutions fails to meet the fundamental conditions governing direct assistance, the NPSA concept provides for the intermediary (i.e., FUNDAGRO) to have the authority to expand its private sector (e.g., RELU) activities, using on a selective basis the available talents and facilities of the PSARO (INIAP) and university departments to implement the RELU programs. This would ensure a continued linking of the public sector (e.g., INIAP), the private sector (e.g., producer associations), and the selected university departments until developing constituency pressure effects the necessary changes to support development of the PSARO (INIAP). FUNDAGRO also would manage a training fund for academic and short course training and English language training for program participants.

Key implementation process issues identified in Ecuador's case include:

- How are resources unavailable to institutions because of failure to meet CPs to be used? (FUNDAGRO will not be able to use effectively in its own programs all of the resources originally destined to INIAP or the university departments, nor should it appear to subsidize operations for which these institutions are ineligible.)

- Will excess funds be available for Mission reassignment, or carried over?

- How will be FUNDAGRO's contribution as financial intermediary and program monitor be financed? What part of its resources should be allocated for constituency-building and forming and managing a joint commission for INIAP?

- FUNDAGRO's undisbursed operating fund under the current DA program will last until 1993. Part of this is programmed against current programs, but some is available for expanded or new activities. How are these project funds to be reconciled with additions coming from this NPSA program?

b. Program Input-Output Relationships

For Ecuador, Table 1 identifies the program input-output relationships.

4. Proposed Program Schedule

The NPSA program proposed by Brown for Ecuador concept assumed that program authorization would be expected up to one year before the GOE meets the CPs for INIAP; hence there was provision for a limited funding requirement for that year. Obligations would be programmed uniformly over the next five years, but allocations would be variable, based on program need and resource availability. Annual funding levels would be programmed at the expected availability of $1M DA and $1.5M LC, but larger amounts might be used effectively if performance warrants and funds are available. Support available to FUNDAGRO's private sector RELU programs would be determined on the basis of INIAP and university needs moderated by performance. Table 2 outlines the proposed task schedule.

Table 3 provides an illustrative, first-approximation budget that Brown noted would probably be unrealistic and unbalanced. In any case, a preliminary budget would need to be developed in each country case. For example, the budget probably would be better balanced with a greater contribution to INIAP and a lower contribution to university departments. However, a larger U.S. Government contribution to INIAP might exceed the increase in the GOE's contribution and endanger budget sustainability. A more precise budget would need to be developed as planning for this program moves forward. The budget would include all traditional A.I.D. budget categories (participant training, commodities, technical services, and other costs, including budget support).

Table 1. Illustrative NPSA Program Input-Output Relationships for Ecuador (Brown, 1990c).

Program Inputs	Program Outputs
INIAP	
1. Budget Support	Rapid Institutional Recovery
2. Management	
a. Diagnostic Study	Directions for New Systems
b. Systems Implantation	New Systems in Effect
3. Technical Services	Rapid Response to Problems
University Departmental Support	
1. University Survey	Quantitative Description
2. Departmental Support Grants	Improved Education
FUNDAGRO	
1. Constituency Building	Support for INIAP CPs
2. Program Management	Guidance & Control
3. Training Program Management	Selection & Management
4. New RELU Programs Management	New Commodity Technology

Table 2. Task Schedule for Proposed USAID/Ecuador NPSA Program to Strengthen Ecuador's Ag REE System (Brown, 1990c)

Year 1	FUNDAGRO Constituency Development Efforts Identify University Departments Negotiate GOE INIAP CP Agreements Design Concentrated Ag Education Program
Year 2	INIAP Management Diagnosis Initiate INIAP Budget Support Initiate University Departmental Strengthening FUNDAGRO Financial Intermediation & Program Monitoring FUNDAGRO Private Sector RELU Programs Undertake Agricultural Education Assessment
Year 3	Install INIAP Management Systems Second tranche of INIAP Budget Support Second University Departmental Strengthening Grant FUNDAGRO Financial Intermediation & Program Monitoring FUNDAGRO Private Sector RELU Programs
Year 4	Complete installation of INIAP Management Systems Third tranche of INIAP Budget Support Third University Departmental Strengthening Grants FUNDAGRO Financial Intermediation & Program Monitoring FUNDAGRO Private Sector RELU Programs
Year 5	Fourth tranche of INIAP Budget Support Fourth University Departmental Strengthening Grants FUNDAGRO Financial Intermediation & Program Monitoring FUNDAGRO Private Sector RELU Programs
Year 6	Fifth tranche of INIAP Budget Support Fifth University Departmental Strengthening Grants FUNDAGRO Financial Intermediation & Program Monitoring FUNDAGRO Private Sector RELU Programs

Table 3. An Illustrative Budget for an Ag REE-Strengthening NPSA Program for Ecuador (Brown, 1990c).

YEARS	1	2	3	4	5	6	TOTALS
				$000s			
INIAP		**900**	**1130**	**960**	**540**	**220**	**3,750**
Budget Support		600	480	360	240	120	1,800
Management Diagnostic Study		250					250
System Design & Implementation		500	500	200			1 200
Technical Services		50	150	100	100	100	500
University Support		**520**	**320**	**320**	**320**	**320**	**1,800**
University Survey		200					200
Departmental Support Grants		320	320	320	320	320	1,600
FUNDAGRO	**250**	**660**	**660**	**910**	**910**	**910**	**4,300**
Constituency Building	100	50	50	50	50	50	350
Financial/Program Mgmt	150	300	300	250	250	250	1,500
RELU Programs				300	300	300	900
Training Fund Management		30	30	30	30	30	150
Fellowships		250	250	250	250	250	1,250
Language Training		30	30	30	30	30	150
Contingency Fund	**400**	**400**	**400**	**400**	**400**	**400**	**2,400**
TOTALS	650	2480	2510	2590	2170	1850	12,250

5. Assumptions

Finally, planning an NPSA program aimed at strengthening a country's Ag REE system needs to be aware of all major program assumptions being made. In the case of Ecuador, Brown (1990c) identified the following as the major program assumptions:

1. The macroeconomic situation will continue to improve, leading to higher demand for technology.

2. The GOE will be able to obtain both executive and legislative concurrence, and will be able to meet the autonomy and budget CPs for INIAP to USAID's satisfaction.

3. The GOE's revenues will be ample to increase INIAP's budget as agreed.

4. The selected universities and departments will be amenable to USAID/Ecuador assistance and will respond to the university survey.

5. The food aid program will continue and provide a stable source of LC to the NPSA program.

C. Summary of NPSA Model for Ag REE-Strengthening

The key components of the NPSA model for strengthening a country's Ag REE system are summarized in Table 4. This model, combined with more conventional project approaches, provides a potential approach to the problem of strengthening Ag REE systems in A.I.D.-assisted LAC countries. Most importantly, the model focuses on the problem of establishing the essential institutional conditions for a demand-driven Ag REE system. Where these conditions are absent, it would be futile to attempt a "capacity building" approach to strengthening a PSARO. However, in this situation (i.e., where the specified conditions are absent), the model provides a means for inducing the creation of those conditions. Once the conditions have been created, the assisted country will have a more favorable environment in which to design and implement projects that are aimed at strengthening the country's Ag REE system.

Table 4. Key Program Components of the NPSA Model for Strengthening a Country's Ag REE System (Adapted from Brown, 1990c).

- Continuing support of a strong intermediary.
- Building a political consensus to secure autonomous status and a larger budget for the public sector agricultural research organization (PSARO).
- Ongoing program coordination and financial intermediation.
- Establishing private technology linkage programs (RELUs).
- Seeking government commitment as a condition precedent re constraints (e.g., autonomy; budget expansion; management; program focus; and substantive area balance).
- Selective university strengthening (e.g., Departmental Strengthening Grants, Agricultural Higher Education System Diagnostic Study).
- NPSA Implementation Plan (e.g., implementation process, program input-output relationships, and program schedule).
- Recognition of assumptions being made.

VI. A Proposed Centrally-Funded AGREE Project to Support Mission-level NPSA Initiatives for Ag REE-Strengthening

The idea or concept for the proposed LAC/DR/RD-funded Agricultural Research, Extension, & Education (AGREE) Technical Support Project to assist Misson-level initatives to develop non-project sector assistance (NPSA) programs for Ag REE-strengthening is modelled on two existing A.I.D. projects: ROCAP's Non-Traditional Agricultural Export Support (PROEXAG) Project which provided technical support to national non-traditional agricultural export (NTAE) promotion organizations; and LAC/DR/RD's Latin American and the Caribbean Agriculture and Rural Development Technical Services (LAC TECH) project that is providing technical support to both LAC/DR/RD and USAID missions throughout the LAC region.

The project concept outlined below applies these models to the agricultural research, extension, and education sub-sector or system. Common to both PROEXAG and LAC TECH is a recognition of the need to provide, in identified sectors, technical expertise that can respond to ongoing needs as well as identify and exploit windows of opportunity as these arise. Accordingly, the project conceptualized in the following would be structured not with a pre-conceived set of ideas about what the problems are but rather with an orientation to provide interested LAC USAID Missions with a ready capability to access the expertise needed to identify key policy and institutional constraints that impede the performance of the Ag REE system and to formulate strategies/programs to relax or remove the constraints.

The proposed strategy for Ag REE-strengthening in the LAC region recognizes: (1) that there is a need to develop, throughout the region, Ag REE systems that are able to carry out demand-driven technology generation and transfer (TG&T); (2) that existing policies and institutions in many A.I.D.-assisted LAC countries impede the emergence of Ag REE systems that are able to carry out market-driven TG&T; and (3) that non-project sector assistance (NPSA), properly applied in an A.I.D.-assisted country, can play a key role in stimulating emergence of a market-driven Ag REE system.

In any A.I.D.-assisted country, the decision to undertake NPSA as a vehicle for leveraging policy and institutional change in the country's Ag REE system would be the prerogative of that country's USAID Mission. However, the whole process of designing and implementing NPSA to leverage policy and institutional change in Ag REE systems, as well as coordinating NPSA with the identification and design of required project assistance can be facilitated and supported by an LAC Regional project such as the one described below.

The proposed AGREE Technical Support Project would assist LAC USAID Missions in designing and implementing policy dialogue aimed at relaxing or removing policy and institutional constraints to the emergence of a demand-driven Ag REE system in the Mission's host country. The constraints initially would be addressed through NPSA-funded policy dialogue, with appropriate simultaneous or follow-up project assistance. The process would be supported and guided by diagnostic studies, either those already completed or undertaken by the project itself.

As a centrally-funded technical support project, AGREE would be designed to assist Missions by providing technical assistance to guide Missions in (1) designing and implementing NPSA targeted on the host country's Ag REE system, and (2) identifying and designing appropriate project assistance to strengthen Ag REE institutions. AGREE also would fund other project-type inputs where it would be impractical or less cost effective to provide such inputs via other current or follow-on projects.[2]

In the specific area of NPSA, AGREE would provide the technical expertise required to assist a Mission in designing and implementing a process of NPSA-assisted policy dialogue aimed at relaxing or removing the policy and institutional constraints on the Ag REE system. Such assistance would include collaboration with potential intermediary organizations in (1) identifying productivity constraints in the Ag REE sub-systems of a country's TG&T system; and (2) formulating a NPSA program that would assist the Mission and client intermediary organization in developing a policy dialogue aimed at building a constituency for the strengthening of the country's Ag REE system.

A. Overview of Project Logical Framework

1. Goal

The goal of the AGREE Technical Support Project would be to increase (1) food security in traditional subsistence food crops, livestock, and import substitution crops and (2) foreign exchange earnings from traditional export and non-traditional agricultural export (NTAE) crops. This goal is to be achieve through generation and transfer of technologies having high market demand.

---

[2]The specific funds available to a host country government from the United States Government for achievement of performance requirements agreed to as a part of NPSA policy dialogue would be provided under an appropriate line item of the host country USAID Mission budget. Provisions could be made to increase the amount of funds available under this line item if NPSA policy dialogue to the Ag REE sub-sector were designated as eligible for funding as part of a performance-based budgeting program under the proposed Development Fund for Latin America.

2. Purpose

The purpose of the AGREE Technical Support Project would be to accelerate demand-driven generation and transfer of improved agricultural technologies through the establishment of market-led TG&T systems that provide for the participation of public and private Ag REE organizations.

3. Outputs

a. Short-term

In the short-term, the project would develop concept papers that identify a NPSA program for a given A.I.D.-assisted country.

b. Medium-term

In the medium-term, the project would assist USAID Missions and client intermediary organizations in implementing the NPSA program, including the translation of NPSA program strategy and project concepts into funded activities (e.g., development of project proposals for submission to donors and governmental funding agencies).

c. Long-term

In the long-term, the project would strengthening research, extension, and education organizations (centers of excellence) and networking targeted on: (1) earning foreign exchange through increased productivity and sale of traditional export and NTAE crops; and (2) meeting food security needs for subsistence food and import substitution crops.

4. Inputs

Inputs for this project would include:

- Long-term and short-term technical assistance (TA);
- Funding for regional and in-country travel;
- Limited commodities (e.g., computers, books, journals); and
- Grant funds for market studies, feasibility and special studies, short-term consulting, participant training (degree and non-degree training), and TG&T activities.

B. General Description of Project Activities

1. Research

The research component would include TA for the design of a strategy and program for increasing client-oriented, demand-driven, and market-led allocation of research resources for generation and adaptive testing of technologies for traditional export and NTAE crops, subsistence food crops, and import substitution crops, with a balanced emphasis on socioeconomic research, experiment station research, on-farm adaptive research, and market studies and analyses.

With respect to market studies and analyses, a potential constraint on a TG&T system's productivity, if measured by the demand for system-generated technology, may well be the lack of expertise and experience in (a) identifying how the structure and functioning of crop markets influence the demand for such crops and, in turn, demand for productivity-increasing technologies for these crops; and (b) incorporating knowledge about (a) into the process of selecting research problems, setting research priorities, allocating research resources; designing research; implementing research, especially at the on-farm level; analyzing and interpreting research findings; developing technological recommendations; and disseminating recommendations to potential users.

2. Extension

The extension component would include TA for the design of market-sensitive technology transfer networks and mechanisms for information dissemination, development of a data bank on specialized expertise available for short-term consulting, and funding assistance to meet identified short-term consulting needs.

3. Education

The education component would include TA for the design of programs for strengthening regional and national agricultural education institutions, including (a) defining university mission and strategic planning as tools for agenda setting, curricula development, staff and organizational development, linkage with critical constituencies; and development of each institution as a center of excellence in one or more specialized fields; (b) incorporating and applying appropriate marketing, learning-by-doing, and problem-solving methods in the educational curricula; (c) linking universities to worldwide sources of advanced innovation in agricultural higher education and research; and managing a participant training program (degree and non-degree training).

Activities within these areas would be implemented on receipt of requests from the potential client organizations (see below), with requests stimulated through a client intermediary organization and USAID Mission contacts with such organizations. But the project's TA team (see below) also would take a proactive stance, identifying windows of opportunity and working to develop the required follow-on action in collaboration with appropriate regional and/or national-level organizations. Emphasis would be placed on developing market analysis expertise, building on the experience and knowledge developed by S&T/RD's Agricultural Marketing Improvement Strategy (AMIS) project.

C. Potential Client Organizations

In each country case, the appropriate client intermediary organization to implement an NPSA program would be identified by the country's USAID Mission. Depending on a country's situation, the client intermediary organization could be a public or private research, extension, or education organization. The organization selected as the intermediary organization would carry out activities aimed at developing a constituency for a strengthened Ag REE system. Further, the organization could implement specific research, extension, and/or education activities, working with and through a range of Ag REE organizations such as outlined in Box 1.

D. Potential Collaborating Resource Institutions

The potential collaboration resource institutions for the project would include the following:

Research: International Agricultural Research Centers (IARCs such as CIMMYT, CIAT, and CIP)
International Service for National Agricultural Research (ISNAR)

Extension: Various private and public sector organizations focusing on technology transfer (e.g., IICA).

Education: U.S. Title XII Universities.

E. Mechanism for Implementing Project

The proposed project concept envisages a 10-year authorization, with an initial obligation of funding for a 5-year period. The project would be implemented via a competitively-let contract with a private consulting firm. The project design would be structured to provide access to Title XII university expertise and support via a competitively-let sub-contract with a single university or consortium of universities or via an associated project-specific IQC providing access to several universities.

Box 1. Generic List of Agricultural Research, Extension, and Education Organizations in the LAC Region.

Research:

- Agricultural schools and universities
- Farmer organizations (cooperatives, associations)
- Private agricultural firms (e.g., input suppliers, food processors, exporters, consulting firms)
- Private NTAE promotion organizations (e.g., CINDE/DIVAGRI in Costa Rica)
- Private agricultural research organizations (e.g., FHIA in Honduras)
- Public sector research agencies (within or outside the MOA)
- Regional research centers (CATIE, CARDI, INCAP)
- Regional networks (e.g., PRECODEPA)

Extension:

- Farmer organizations (e.g., cooperatives)
- Private agricultural firms (e.g., input suppliers, food processors, exporters, consulting firms)
- Private NTAE promotion organizations (e.g., CINDE/DIVAGRI in Costa Rica)
- Public sector extension agencies (usually within the Ministry of Agriculture)

Education:

- Regional Cooperative Network for Education & Training in Agricultural & Renewable Natural Resources (REDCA)
- Post-secondary agricultural education institutions such as the following:
  - CATIE, Costa Rica
  - EARTH, Costa Rica
  - ENA, El Salvador
  - EAP, Honduras
  - ISA, Dominican Republic
  - JSA, Jamaica
  - UWI, Trinidad
  - UNA, Perú
  - Others (to be identified)

Management

- INCAE

F. Technical Assistance Component

The project's technical assistance (TA) component would provide a series of TA contracts (2-year, an optional 2-year extension contingent on satisfactory performance during the first two years, and a similarly contingent optional 1-year extension) with a private consulting firm that would field a TA team comprised of four advisors and a project director:

- **Agricultural Marketing Advisor**--to assist in identifying the structure of the market for various crops, key constraints in the market that impact on farmer demand for productivity-increasing technologies for these crops, and implications of such constraints for agricultural research, extension, and education programs focusing on those crops.

- **Agricultural Technology Generation Advisor**--to assist in identifying research needs and opportunities, designing research studies, writing proposals, seeking research funding, and providing technical counsel to researchers.

- **Agricultural Technology Transfer Advisor**--to assist in developing agricultural TG&T networks, improved technology transfer methods, and information dissemination mechanisms such as workshops, conferences, journals, etc.

- **Agricultural Education Advisor**--to assist in identifying strategies and developing degree and non-degree curricula, and linking curricula to the overall TG&T system.

- **Project Director** (to coordinate, administer, and represent the project vis-a-vis client organizations, USAID Missions, and other donors; and to manage project's funding components as detailed below.

G. Funding Component

The project's funding component would provide partial funding to support a variety of activities identified during the country-specific NPSA process as meriting implementation, with the balance of the required funding being provided through Mission buy-ins or contingency funding under other existing Mission projects. Potential NPSA-identified activities could be funded under one or more of the following:

- **Policy Dialogue Fund**--to support costs such as meetings, workshops, seminars, and conferences incurred in developing policy dialogue during implementation of an NPSA program.

- **Market Studies Fund**--to conduct studies of the structure and functioning of local, regional, and export crop markets.

- **Feasibility and Special Studies Fund**--to conduct feasibility and special studies required for program planning.

- **Short-Term Consulting Fund**--to support provision of short-term consulting where this is identified as being needed. Possible areas in which short-term consulting may be needed include agricultural nutrition, policy, marketing, inputs, agro-industry, credit, communication, and research management.

- **Participant Training Fund**--to support degree and non-degree training as well as short courses.

- **TG&T Grant Fund**--to provide partial funding to support implementation of TG&T activities (e.g., a research grant fund to support young scientists who have recently completed an advanced degree, to ensure that they are able to apply their skills to market-relevant problems).

H. Location of Project Office

A project office would be established at a selected location in either the U.S. or one of the LAC countries. The location selected would depend on the site selection criteria chosen and the weighting assigned to each criterion. These criteria could include but would not necessarily be limited to the following:

- Proximity to LAC/DR/RD in Washington, D.C.
- Proximity to a regional agricultural research center
- Proximity to a private agricultural research foundation
- Proximity to an agricultural university
- Proximity to a library on agriculture in the LAC region
- Proximity to conference and workshop facilities
- Proximity to a major hub of NTAE activity
- Proximity to an international airport providing direct air service or connections to the major LAC cities

Based on these criteria, possible locations for the project office could include:

- Washington, D.C. (close to LAC/DR/RD)
- Guatemala City, Guatemala (close to PROEXAG)
- San Pedro Sula, Honduras (close to FHIA)
- San José, Costa Rica (close to IICA)
- Turrialba, Costa Rica (close to CATIE)

Figure 2 provides a matrix illustrating the possibilities.

Figure 1. A Matrix of Possibilities for Locating Project Office for the AGREE Technical Support Project.

Code: A = Washington, D.C.
B = Guatemala City, Guatemala
C = San Pedro Sula, Honduras
D = San José, Costa Rica
E = Turrialba, Costa Rica
F = Other (as identified by reader)

PROXIMITY TO:	A	B	C	D	E	F
A.I.D./Washington LAC/DR/RD	✓					
A Regional Agricultural Research Center				✓	✓	
A Private Agricultural Research Foundation			✓			
An Agricultural University	✓				✓	
A Library on Agriculture in the LAC Region	✓			✓	✓	
Conference and Workshop Facilities	✓	✓	✓	✓	✓	
A Major Hub of NTAE Activity		✓	✓	✓	✓	
An International Airport w/ Good LAC Connections	✓	✓		✓		
Other Criteria (as identified by reader)						
WEIGHTED TOTAL (would depend on weights)						

I. Potential Experience to be Transferred/Applied Through Project

1. Marketing

- Experience of the S&T/RD Small Farmer Marketing Access and Agricultural Marketing Improvement Strategy (AMIS) projects.

2. Research

- Food crops--research findings from the IARCs and other technology sources; various reviews of A.I.D. project experience with agricultural research projects, most recently, CDIE's review of A.I.D. experience with FSR/E projects and ISNAR's review of OFCOR (on-farm client-oriented research).

- NTAE crops--review of the research mechanisms being used to support adaptive and more basic or applied research on NTAE crops.

- Coordination of project design and implementation with proposed LAC/DR/RD "Caribbean Basin Growers Association Project."

3. Extension

- Food crops--Communication for Technology Transfer in Agriculture (CTTA) Project experience at various sites including Honduras and Peru.

- Food crops--IICA experience with agricultural TG&T.

- NTAE crops--PROEXAG experience in facilitating technology transfer through "deal-making" and other mechanisms (e.g., study tours).

- NTAE crops--LAC-sponsored cross-cutting analysis of NTAE and crop diversification.

- Coordination of project design and implementation with proposed LAC/DR/RD "Caribbean Basin Growers Association Project."

- Farmer organizations--Evaluation of USAID/Bolivia Private Agricultural Organizations (PAO) project.

4. Education

- Food crops--development and/or updating of curricula and learning resources (e.g., text books, computer-assisted instructional software).

- NTAE crops--development and/or updating of curricula and learning resources (e.g., text books, computer-assisted instructional software).

- Review of proposal to ROCAP for a regional higher agricultural education project; and CDIE cross-cutting analytical studies on agricultural higher education.

Annex A. "Demand-Driven" Ag REE Systems

This annex focuses on the concept of a "demand-driven" Ag REE system. The annex reviews the need for a "demand-driven" Ag REE system; essential conditions for establishing a "demand-driven" agricultural technology generation and transfer (TG&T) system; and the research, extension, and education functions essential for carrying out agricultural TG&T within an Ag REE system, albeit public, private, or a combination of these. The annex provides a key conceptual foundation for the body of this paper.

A. A "Demand-Driven" Ag REE System

1. Need for "Demand-Driven" Agricultural TG&T

There continues to be a need in the LAC region for increased farmer productivity in traditional and non-traditional export crops as well as in traditional subsistence and import substitution crops. A potential explanation for this continuing need is the low productivity of agricultural TG&T systems in the region, particularly within the public sectors of most A.I.D.-assisted LAC countries. Typically public sector TG&T systems have been plagued by:

- A failure of national leadership to recognize the potential importance of agriculture to a country's economic and social well-being; the role of TG&T systems in increasing the productivity of a country's agriculture; and the role of the Ag REE system in raising the productivity of the TG&T system.

- A failure to provide potential beneficiaries of agricultural research, in particular, farmers knowledgeable about production and marketing constraints, effective participation in in the process of identifying the problems on which research is needed, establishing research agendas (i.e., setting priorities for research), and allocating research resources.

- A failure to commit the financial and human resources needed to be able to develop productive Ag REE system, with key research and extension positions in public sector TG&T systems often filled by persons having qualifications that are more political than technical.

While these problems are now well known, they continue to persist. Yet A.I.D. development assistance all too often has continued to rely on a "supply-oriented" approach (that has been aimed only at "capacity building" (see Box 6.1) developing or strengthening the technical capability of national agricultural research and extension organizations to carry out TG&T activities), without paying adequate attention to more basic policy and institutional constraints that function as disincentives to productive TG&T (e.g., failure to allocate adequate resources to carry out agricultural research). Indeed, a failure to allocate the resources needed to carry out productive TG&T reflects that the system has not yet been structured in a way that allows potential beneficiaries to demand an Ag REE system having the technical capability to carry out productive agricultural TG&T.

Box A-1. The Rise and Fall of a Supply-Driven Concept of TG&T in the LAC Region.

The concept of supply-driven TG&T in the LAC region can be traced to before World War II, with agriculture being a prime target for the model's application. As Vessuri (1990:1544) observed:

> "Theories of economic progress were common in the region before World War II. During the 1930s and 1940s, a few scientific leaders advocated government support of fundamental research, usually on a shared basis with international donors, as a means of constructing scientific communities and economic development, which were assumed to be causally linked. . . . The aim was to form a 'scientific-technical' infrastructure, assuming, often implicitly, that on reaching a critical mass there would be an automatic reinforcement of local technology.... ...this would increase both production and productivity. The stage for public science and technology policy was set in the 1950s, and its most vocal advocates were leading figures from the academic scientific community.
>
> "The national elites in academic science, generally with the technical-ideological help of international agencies, managed to convey to several Latin American governments and social leaders the view that there was a linear, one-way flow of ideas from fundamental research through development to commercial or operational application. The model was appealing because it was simple to interpret and transmit. For many years, nobody contradicted this model of the genesis of technological innovation.... In the real world, however, things did not function according to such a simple, elegant picture. In practice, this scheme helped to increase the number of higher education and research institutions, as well as the number of researchers. However, the scheme was unable to reinforce local technology, which remained incipient and continued to complement imported technology, without much influence on the productive structure."

In short, the problem may not have been the result of any lack of ability or willingness to supply more productive technologies; rather it may result from constraints on the demand for technology. Often these constraints, as ROCAP's Non-Traditional Agricultural Export Promotion (PROEXAG) project has demonstrated, lie not in a lack of supply of agricultural technology but rather in a lack of effective demand for technology. Once PROEXAG had assisted potential growers of non-traditional agricultural export (NTAE) crops (e.g., melons) to link up with potential U.S.-based importers of these crops, a link was established between Central American growers and a market with a demand for crops which those growers could supply. The market's requirement for crops meeting certain quality standards induced (created) a demand on the part of growers for improved production, pest management, and post-harvest handling technologies as well as an incentive for private sector receivers (e.g., importers) to assist growers in acquiring the required technology or in undertaking the adaptive research needed to "nail down" the required technology (Byrnes, 1989).

This demand-driven TG&T process needs to be supported and cultivated if the gains in production and productivity of NTAE crops are to be maintained and expanded. But this demand-driven or market-led dynamic also needs to be activated in the farming sectors that supply subsistence food (e.g., maize), import substitution (e.g., onions), or traditional export (e.g., cacao) crops to local, regional, and/or export markets. This requires greater participation by agricultural producers in identifying research problems, setting research agendas, and allocating research resources. Such producers are the clients and potential market for agricultural technologies generated by research and transferred by extension. Only such producers can adopt improved technologies having the capability of increasing yields, raising incomes, and increasing agricultural production and marketing revenues. Only by channeling a portion of such increased revenues back into the agricultural TG&T process can a country develop self-sustaining Ag REE institutions.

But rather than developing a market-led approach to TG&T, donors such as A.I.D. have continued to pursue supply-oriented (i.e., "capacity building") approaches, largely based on the assumption that the principal constraint to increased agricultural productivity was a lack of productivity-increasing technology, and that the key missing ingredient to effective TG&T was "capacity building." Yet the major constraint may actually have been the lack of effective demand for improved technology and the installed capacity that would be needed to generate and transfer this technology to farmers.

As a result, donors such as A.I.D. have tried for years to push a basically "capacity building" or "technological" fix, without ensuring that there is adequate or sufficient demand for the "fix." When project interventions did not live up to expectations, evaluation teams identified numerous "process" factors that impeded counterpart research and extension organizations, almost always public sector entities affiliated with a Ministry of Agriculture, from implementing effective TG&T. These identified "process" factors were basic institutional constraints to carrying out agricultural TG&T through public sector Ag REE organizations. But A.I.D. and other donors generally have failed to admit the full impact of such institutional constraints or have not been able to devise a way to remove or relax them.

An often identified constraint has been the failure of the national government to meet counterpart operating expense budget commitments. The explanation for this failure often has been that governments lack adequate resources or fail to understand the importance of agriculture, when in fact the real reason for the failure to allocate resources to agricultural research was the failure to involve constituencies having effective power to pressure the government to allocate to agricultural research a share of the public purse commensurate with agriculture's potential or even actual contribution to the national well-being.

Over the years, donor patience began to wear thin. During the 1980s, A.I.D. began to cut back on development support for public sector Ag REE in LAC region. In some cases, USAID Mission project support for TG&T was completely terminated (e.g., ATD and ATT in Panamá), while support was significantly reduced in others (e.g., ICTA, Guatemala). Further, LAC USAID Missions began to pursue a policy of redirecting support for agricultural research from the public to the private sector (e.g., FHIA in Honduras and FUNDAGRO in Ecuador). However, this redeployment of funding support only further weakened TG&T capability, especially in smaller countries facing a dual TG&T needs--to earn foreign exchange via production and sale of traditional and non-traditional agricultural export (NTAE) crops; and to meet food security targets for subsistence food crops.

In retrospect, the LAC USAID Mission response (i.e, reducing project support to public sector agricultural research and extension) was probably inappropriate, <u>if</u> the real constraint to farmer adoption of improved technology was not any lack of ability to supply productivity-increasing technology but rather the lack of demand for the technology. If this is the case, then better understanding of actual or projected demand for a crop (e.g., the constraints on local and regional markets for subsistence food crops) potentially could play an important role in identifying strategies and programs to stimulate demand for these crops and, in turn, demand for technologies to increase efficiency in the production, post-harvest handling, and marketing of these crops.

Specifically, a better understanding of the market demand for a crop as well as the production and marketing constraints facing producers of that crop would provide essential data for determining whether research should be carried out on that crop and, if so, what research would have the greatest likelihood of producing technology that farmers would demand (i.e., adopt) as well as the increased revenues that could provide a sustainable basis of support for the Ag REE system to carry out TG&T on that crop.

Given these factors, as well as the many encouraging changes (e.g., improved terms of trade for agriculture) now occurring in the macroeconomic and policy environments of many countries in the LAC region, the time may be propitious for A.I.D. to assess whether a more market-led, demand-driven, and client-oriented approach to Ag REE-strengthening could play a major role in activating TG&T systems capable of generating technologies having strong actual or projected market demand. Such an approach would place due emphasis on strengthening those parts of a country's overall Ag REE system that are constraints on agricultural TG&T. Such an approach would <u>not</u> be premised on the assumption that each country should have or cannot afford to be without an all-encompassing Land Grant-type REE institution. Rather it would be based on the concept that each country must identify it own strategy for coordinating the provision of essential REE functions, albeit they are provided by public or private organizations, and albeit they are located within that country or elsewhere.

2. <u>Conditions for a "Demand-Driven" Ag REE System</u>

The demand for an agricultural REE system is a "derived" demand, one deriving from the agricultural sector's demand for productivity-increasing technologies for the production and marketing of agricultural crops. If there is demand for agricultural generation and transfer (TG&T), there will be a demand for an Ag REE system to generate the technology that agricultural producers demand, to transfer this technology to those producers, and to educate the agricultural specialists that the Ag REE system requires (i.e., researchers, extensionists, and educators) but also for the agricultural sector in general (e.g., agribusiness technicians and managers).

However, in many, if not most or all, A.I.D.-assisted LAC countries, the demand of agricultural producers (i.e., farmers) for agricultural TG&T and, in turn, a productive Ag REE system often is an unarticulated demand. Farmers, particularly traditional subsistence and even small commercial farmers, have no control over a country's macroeconomic policies that often are detrimental to the agricultural sector; as a result, there is little or no incentive to invest in the agricultural inputs (e.g., seed, fertilizer, irrigation systems, etc.) required to adopt and use productivity-increasing agricultural technologies, assuming that such technologies are even appropriate to such farmers. Also, these farmers have little to no control over their access to key agri-support factors (e.g., market, credit, land, etc.) (Byrnes, 1985). Generally, the agricultural policies of many countries in the LAC region are stacked against the rural, agricultural sector and in favor of the urban, industrial sector. A concrete result of this bias is that public sector budget allocations for Ag REE institutions are disproportionately low compared with agriculture's potential or even actual contribution to the general economy.

Yet there is a potential role which the Ag REE system can play in A.I.D.-assisted LAC countries in helping to create a supply of and demand for productivity-increasing agricultural technologies and the TG&T systems that produce and make these technologies available to farmers. In their theory of induced institutional innovation, Yujiro Hayami and Vernon Ruttan (1984:56; Ruttan and Hayami, 1984:211, 217-218) point to the potential role that private sector farmer organizations can play in creating a demand for agricultural support institutions that effectively reduce constraints to TG&T. Their research findings demonstrate that technological change in any given agricultural situation will likely depend on implementing a mix of technical <u>and</u> institutional reforms that reallocate resources "so as to remove those resource constraints that are most inelastic and those institutional constraints that are most restrictive to growth and development" (Ruttan, 1978:413).

Addressing the question of which types of technical and institutional reforms are required for technological change in developing country agriculture, Hayami and Ruttan (1984:56) cite Grabowski's (1981) statement that, in addition to developing a variety of agricultural research activities, there is a need for

> an increase in power and influence of farmers with small farms, relative to those with large farms, on government decisions concerning agricultural research and credit priorities. This could possibly be accomplished through land reforms or, a less radical solution, <u>the organization of small farmers into groups which could put pressure on government agencies to recognize and respond to the interests of small farmers"</u> [emphasis added].

While Hayami and Ruttan (1984:56) assert that such technical and institutional reforms are "clearly desirable", they ask: "But what are the conditions that make them [the clearly desirable reforms] economically and politically viable [emphasis added]?"

There is increasing evidence that emergence of a "market-led" or "demand-driven" Ag REE system depends, in large measure, on establishing two conditions: (1) increased involvement of the private sector in designing, implementing, and evaluating TG&T activities carried out by Ag REE institutions; and (2) leveraging institutional change in the public sector (e.g., autonomy of public agricultural research organizations and increased budget support). Establishing these conditions is essential if Ag REE systems, especially public Ag REE organizations, are to carry out client-oriented, demand-driven, and market-led agricultural TG&T successfully, that is, agricultural research and extension that is responsive to market opportunities and the technological needs of farmers.

Specifically, for market-oriented TG&T to occur, Ag REE institutions, such as a public sector agricultural research organization (PSARO), must develop research program selection criteria that include inter alia: (1) the anticipated market environment and expected cost/benefit of program alternatives; (2) the relative importance of crops within and among commodity groups, (e.g., basic food crops vs. NTAE crops); and (3) the specific needs and capabilities of client groups (e.g., small traditional vs. medium-to-large mechanized farmers). The need to take different client groups' needs and capabilities into account when organizing an agricultural TG&T system is highlighted in a recent report by Kaimowitz and Vartanián (1990) on strategies for technology transfer for Central America. They propose a typology that disaggregates conventional technology transfer strategies as a function of the following research beneficiary categories:

1. Large mechanized producers;
2. Growers of non-traditional agricultural export crops;
3. Small and medium sized farmers using the land intensively;
4. Agricultural frontier farmers;
5. Medium and large sized cattle ranchers;
6. Marginal farmers; and
7. Agrarian reform farmers.[1]

---

[1]Kaimowitz and Vartanián note the somewhat arbitrary nature of this typology. For example, more than seven groups could be identified. Some producers could be classified into two groups or could find themselves in an intermediate situation among two or more groups. Among the more significant groups not included as distinct cateogries in the typology are medium and large sized coffee growers, the banana companies, and indigenous communities.

Each category delineates a particular group of farmers that has its own characteristics and technological problems which, in turn, have implications for the type of public or private entity that is in the best position to provide institutional support for technology transfer. But this concept also may be extended to identifying the type of public or private entity that is in the best position to provide institutional support for technology generation responsive to the technology needs of specific client groups. A preliminary typology to define a client-oriented TG&T strategy for each client group is presented in Table A-1. The TG&T strategy appropriate for each beneficiary group also has implications for the mix of public and/or private financing that will be required to sustain TG&T for that beneficiary group.

In other words, the mix of public and/or private financing that is needed to sustain TG&T for non-traditional agricultural export crops (e.g., melons) is very different from the financing mix required to sustain TG&T for traditional food crops (e.g., corn). Generating most agricultural technology for subsistence or basic food crops is a public good, the benefits of which accrue to thousands of farmers and millions of consumers who cannot perform this function in a cost effective way. Thus, for such research, public revenues finance a public sector institution to perform this function. By contrast, the private sector funds agricultural research having a high probability of leading to the development of products (e.g., seeds) that embody the improved technology and that can be sold to farmers. The private sector finances agricultural research through the profits recovered by selling products that embody the technology developed through agricultural research. Similarly, society recovers the cost of public sector investments in agricultural research on basic food crops through the increases in farmer income and reductions in consumer food bills made possible by TG&T that leads to farmer adoption of yield-increasing crop production technologies.

If this is the case, what role can donor agencies such as A.I.D. play to stimulate coordinated and sustained public and/or private sector funding for each identified beneficiary group? Yet other important questions also will need to be answered in each country case, including: What arrangements for developing research program selection criteria will ensure that the criteria reflect good science, producer and consumer welfare, and national development needs? How can the criteria be applied to selection or rejection of activities and their subsequent evaluation? What role can a USAID Mission play in assisting the Mission's host country to develop the essential conditions for a client-oriented, demand-driven, and market-led agricultural REE system? We return to this question at the outset of section C below.

Table A-1. Typology of Producers for Defining a Client-Oriented TG&T Strategy (Adapted from Kaimowitz and Vartanián, 1990:48).

Beneficiary Category	Technological Problems	Institutional Locus for TG&T Support	Technology Transfer Focus
Large mechanized producers	Reduce costs Sustainability	Parastatal or private, by crop; producer associations	Individual technical assistance and programs by crop
Growers of non-traditional export crops	Learning how to grow new crops, quality, post-harvest handling	Private technical assistance; private agricultural research foundations; universities	Vertical integration and support to groups by crop; individual assistance with adaptive research
Small and medium sized producers using the land intensively	Yields at low cost, pests and diseases, agro-industry	MOA & Research Institutes, supervised credit, coffee institutes, CATIE	Farming Systems Research & Extension; rural communication plans
Agricultural frontier farmers	Sustainability	Few: colonization institutes and natural resource agencies	Not defined
Medium and large sized cattle ranchers	Intensify "alimentación de verano"	Producer associations; financial sector; private technical service	Supervised credit; individual technical assistance
Marginal farmers	Low cost technology, sustainability, new souces of income	Rural development projects; non-governmental groups (NGOs) & private voluntary organizations (PVOs)	Incorporating TG&T as part of agricultural development projects
Agrarian reform farmers	Management and organizational improvements	Agrarian reform institutions and campesino organizations	Organization and training of campesinos en TG&T

3. Functions of a "Demand-Driven" Ag REE System[2]

Having identified key conditions for establishing a client-oriented or demand-driven TG&T system, this section outlines the research, extension, and education functions that are carried out in such a system. Of course, given that the essential conditions specified in the preceding section have been established, each country yet must determine how these system functions--research, extension, and education--are to be provided and coordinated for each client or beneficary group, and how these functions are to be financially sustained from public and/or private sources.

a. Research

The responsibility of this function is to acquire or generate technology having potential to alleviate constraints to the production and/or marketing of crops having current or projected market demand and adapting this technology through experiment station and on-farm research to the ecological and cultural conditions under which the technology is to be used. Research is a highly technical operation requiring leadership by well-qualified professionals, i.e., postgraduate specialization to the Ph.D. or equivalent experience. Implementation of the research function normally involves a mix of public and private participants, including a public sector research organization, private sector product-oriented research, and academic (discipline-oriented) research within a university. All three types of research are essential.

(1) Public Sector Research

As previously noted, development or validation of most agricultural technology for subsistence or basic food crops is a public good, the benefits of which accrue to thousands of farmers and millions of consumers who cannot perform this function in a cost effective way. Generally, public revenues finance a public sector institution to carry out TG&T for basic food crops. The wide range of agricultural research programs underway at the International Agricultural Research Centers (e.g., International Rice Research Institute in the Philippines) provide an example of such public sector research at the international level. However, the majority of public sector research is carried out within individual countries (e.g., EMBRAPA's research programs in Brazil), although there are also examples of public sector regional agricultural research centers--the Tropical Agricultural Research and Training Center (CATIE) in Costa Rica and the Caribbean Agricultural Research and Development Institute (CARDI) in Trinidad.

---

[2]This section draws draws heavily on a concept paper that was prepared by Scaff Brown (1990c).

(2) Private Sector Research

Considerable technology is developed by private firms, motivated by the potential profit from its sale. For such technology research to be profitable, the costs of carrying out the research plus any profits to be earned must be recovered through sale of the technology in the market. If private sector entrepreneurs do not see any potential profit to be made by investing in research to develop technology, they will invest their resources not in research but elsewhere. Recovery of the costs incurred in carrying out research to develop new technology is facilitated when the technology is embedded in a salable product (e.g., livestock, semen, machinery, seed, fertilizer, pesticides, irrigation equipment) or related services. Private firms investing in agricultural research also may benefit from basic, applied, or adaptive research performed by the public sector; they and their farmer clients also benefit from technology validated through public sector adaptive research and extension such as site-specific varietal trials carried out by public sector extension agents.

(3) Academic Research

Research carried out within agricultural colleges and universities is highly complementary to public and private sector research, and is essential to scientific education. It provides a cost-effective way to utilize scarce talent to solve agricultural problems. Professors who perform good research must keep current in their field, and are better able to guide students. Student research provides vital laboratory and field experience, and an opportunity to absorb the discipline and curiosity of the scientific method, useful in subsequent professional employment, albeit working as a farmer, agricultural researcher, agricultural extensionist, or in another agriculturally-related occupation.

b. Extension

Transfer of research-generated technology to farmers, and their decision to use such proffered technology, is a complex process that is carried out via a mix of communication methods. Often these methods are performed by public sector institutions, including formal extension services and extension specialists in other organizations; private sector banks; input supply houses; purveyors of technical assistance; processors of agricultural products; private voluntary organizations (PVOs); and universities. Each organization has its own motivation and client focus, which frequently overlap. But the overlap is not without value. The decision to adopt a technology is based on the farmer's incentive, not on that of the extension organization recommending the technology to the farmer. The farmer's decision to use a technology often is based on information received repeatedly from multiple sources (e.g., experience, field research and/or extension participation, other farmer experience with the technology).

It is a proper, and indeed vital, responsibility of public research organizations to provide research results, in readily useable form, not only to other investigators, but to all types of organizations in a position to carry out follow-on, more site-specific adaptive research and technology transfer (the extension function) vis-a-vis potential users of the technology. Where the technology in question has been developed by the private sector, the research results are proprietary and accordingly little or no dissemination will occur if this potentially would be damaging to the firm's competitive position in the marketplace.

c. Education

Science-based agriculture is a highly complex, technically oriented subject. The effective performance of research, extension, and education all require well-educated professionals, trained in applying one or more of the earth, physical, biological, and socioeconomic sciences to agricultural production and marketing. Agricultural faculties are responsible for implementation of the education function. To fulfill this responsibility, such faculties must be staffed with professors who are far better prepared than their own students, who are kept current in their fields by personal research, and who have an understanding of farmer practices and needs through direct field work with farmers. Their students need opportunities to conduct supervised research and extension, and to gain practical experience in both field and laboratory science and in communicating with other researchers, extensionists, and farmers.

B. Implications for a Demand-Driven Ag REE System

Any Ag REE system that is to be self-sustaining, particularly in an increasingly competitive and interdependent global economy, must provide for coordinated provision of these key REE functions, including (1) public, private, and academic research; (2) extension or technology transfer, albeit through public or private organizations; and (3) education. A country does not necessarily need an all-encompassing agricultural research, extension, and education organization (e.g., a Land Grant-type university) in order to secure coordinated provision of these functions in a productive and timely manner. Indeed, where a country is very small or has extremely limited resources, it would not make economic sense to attempt to create such an all-inclusive organization to serve that country's limited research, extension, and education needs, since the potential returns could be very small relative to high fixed and variable costs involved in establishing and sustaining such an organization.

Thus, for example, it would be extremely impractical for a small country such as Belize or a resource-poor country such as Haiti to attempt to establish a national agricultural research system such as exists in large or resource-rich countries like Colombia, Brazil, or Mexico. But small countries such as Haiti or Belize, if their agricultures are to become more productive and competitive, must provide for coordinated provision of the research, extension, and education functions needed to alleviate existing technological constraints to the production and marketing of crops on which these countries' economies and social well-being are very much dependent. Further, the Ag REE functions must be organized and provided in a coodinated way responsive to actual or potential market demand and client circumstances, in order to ensure that agricultural TG&T will produce technologies that are in demand and will be adopted by farmer beneficiaries.

What role can a USAID Mission play in assisting the Mission's host country to develop the essential conditions for a client-oriented, demand-driven, and market-led Ag REE system? The answer to this question is the subject of the body of this paper.

References

Brown, Albert L. (Scaff)

1990a Non-Project Sector Assistance (NPSA): Conditions for Success. A Concept Paper. Washington, D.C.: LAC TECH, Chemonics International Consulting Division.

1990b Non-Project Sector Assistance. A Concept Paper for USAID/Ecuador. Washington, D.C.: LAC TECH, Chemonics International Consulting Division.

1990c Ecuador NPSA Concept Paper: Research, Education and Extension. Prepared for USAID/Ecuador. Washington, D.C.: LAC TECH, Chemonics International Consulting Division.

1990d Central American Agricultural Research and Professional Education. A Concept Paper for ROCAP. Washington, D.C.: LAC TECH, Chemonics International Consulting Division.

1990e Study on Status of Agricultural Research and Higher Education in Central America. A Scope of Work prepared for ROCAP. Washington, D.C.: LAC TECH, Chemonics International Consulting Division.

Byrnes, Kerry J.

1985 The Potential Role of Farmer Organizations in Increasing the Productivity and Income-Earning Capability of Small Farmer Agricultural Systems in the Developing Countries: A Concept Paper. Washington, D.C.: Academy for Educational Development.

1991 A Cross-Cutting Analysis of Agricultural Research, Extension, and Education in A.I.D.-Assisted LAC Countries: Volume I: Technical Report; and Volume II: Annexes. Washington, D.C.: U.S. Agency for International Development, Bureau for Latin America and the Caribbean, Office of Development Resources, Rural Development Division (LAC/DR/RD).

Grabowski, Richard

1981 "Induced Innovation, Green Revolution, and Income Distribution: Comment," Economic Development and Cultural Change, 30(1):177-181.

Hansen, Gary E.

1989a Universities for Development: Lessons for Enhancing the Role of Agricultural Universities in Developing Countries. A.I.D. Evaluation Occasional Paper No. 31. Washington, D.C.: Center for Development Information and Evaluation, U.S. Agency for International Development.

1989b The Impact of Investments in Agricultural Higher Education. A.I.D. Evaluation Highlights No. 5. Washington, D.C.: Center for Development Information and Evaluation, U.S. Agency for International Development. [PN-ABD-922]

Hayami, Yujiro, and Vernon Ruttan

1984 "The Green Revolution: Inducement and Distribution," The Pakistan Development Review, 23(1)(Spring):37-63.

Johnson, D. Gale, Alberto Valdes, Dennis McCaffrey, and Jo Anne Yeager

1991 LAC Bureau Agriculture and Natural Resources Strategy (Draft). Bethesda, Maryland: Agricultural Policy Analysis, Project, Phase II, Abt Associates.

Kaimowitz, David, and Daniel Vartanián
1990 Nuevas Estrategias en la Transferencia de Tecnología Agropecuaria para el Istmo Centroamericano. San José, Costa Rica: Inter-American Institute for Cooperation on Agriculture.

Ruttan, Vernon W.
1978 "A Postscript on Alternative Paths of Induced Institutional Change," Chapter 14 in Binswanger, H.P., V.W. Ruttan, et al., Induced Innovation: Technology, Institutions and Development. Baltimore: Johns Hopkins University Press.

Ruttan, Vernon W., and Yujiro Hayami
1984 "Toward a Theory of Induce Institutional Innovation," The Journal of Development Studies, 20(4)(July):203-223.

Venezián Leigh, Eduardo and Jesus Moncada de la Fuente
1989 Ecuador: Propuesta de un Sistema de Investigación y Transferencia de Tecnología Agropecuaria. Quito: Ecuador: MAG/USAID.

Vessuri, Hebe M.C.
1990 "O Inventamos O Erramos: The Power of Science in Latin America," World Development, 18(11):1543-1553.