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GUIDELINES FOR ASSESSING AGRICULTURAL RESEARCH, EDUCATION,  
AND EXTENSION SYSTEMS IN DEVELOPING NATIONS

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THE AGENCY FOR INTERNATIONAL DEVELOPMENT  
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## INTRODUCTION

Background. Over the past decade, AID and other donor agencies have placed primary programmatic emphasis on interventions designed to directly enhance the welfare of the low-income strata of the less developed nations. In agriculture, major emphasis has been placed on projects which are intended to strengthen small farmers' production capacity and access to credit, input and product markets. This emphasis was required by the Congressional Mandate for direct assistance to the poor majority as provided in the Mutual Security Act of 1973. A secondary consequence of the Congressional Mandate was the reduction of support for building agricultural research, education and extension (REE) programs largely on the grounds that the direct beneficiaries of such programs are the employees of these organizations and the contention that they do not indirectly benefit the poor majority. However, passage of Title XII in 1976 expressed the congressional commitment to also strengthen REE in the less developed countries (LDC's). Recent policy statements and directives of the AID administrator further supports programmatic redirection toward support of building REE capacity.

Along with credit and input supply, planning, agricultural product marketing, and agricultural production institutions, it has engineering and agrochemical research. Through sale of machinery and chemicals, the private firm may derive financial returns to its

investments. However, because many types of machinery and chemicals are largely labor saving rather than land saving, research investments must be chosen carefully. Research on biological innovation and management practices are best conducted in the public sector as the private entrepreneur has few means for capturing significant portions of the gains created by these types of research.

Extension, too, is essential to agricultural development, to teach farmers to utilize the modern technologies developed by research. As in the case of research, there is room for the private sector in Extension, but it must be primarily a public sector function in the LDC's. The private sector may provide education in new technologies when those technologies are embodied in an input which can be sold for profit. However, many new technologies cannot be embodied in an input or it may be impossible to obtain an exclusive right to them. As a result, the public sector's informal education programs remain a key ingredient to achieving agricultural development.

Purposes of these Guidelines. These guidelines are designed to provide an analytical framework to assist host country and donor agency specialists to assess current and future capacity of REE institutions to provide the services needed for agricultural and rural development; to identify key constraints to more effectively functioning institutions; and, ultimately, to design a long-term strategy to reduce these constraints via revised policies and host

government and donor agency funded projects. It is anticipated that a long-term strategy design will be undertaken when REE is seen as a bottleneck to further agricultural development and knowledge is insufficient for designing interventions to eliminate the bottleneck. Normally, need for such a study would be identified in an agricultural sector assessment. Numerous conditions are indicative of the necessity for strengthening REE; among them are (a) inadequate numbers of trained agriculturalists in spite of strong interest among young people in agricultural education, (b) large numbers of agriculturalists lacking adequate technical skills, (c) stagnant productivity in the agricultural sector or in the production of certain agricultural commodities, particularly if other countries with similar agro-ecological conditions are increasing productivity, and (d) failure of farmers to adopt the recommendations emanating from the research and extension institutions.

Although these guidelines were designed for developing a long-term strategy, they may also be adapted for more constrained uses. It may be desirable under some circumstances to undertake a study of only one component of REE: research, education, or extension. For example, it may have been determined that agricultural education is a key bottleneck requiring intervention. These guidelines could then be used to assess the current state of agricultural education in order to design a long-term strategy or to simply design the particular interventions that will be pursued immediately (i.e., develop project identification documents).

In preparing these guidelines, it was anticipated that they would be utilized by at least three different types of teams: by host country and donor agency sponsored ad hoc teams organized to conduct special in-depth studies of agricultural research, education and extension; by teams implementing projects designed to strengthen one or more elements of REE as an integral component of team's projected planning and implementation process; and by government offices and donor agencies undertaking diagnostic studies of agricultural research, education, and extension in order to determine the need for more in-depth studies. Although this manual assumes a comprehensive, in-depth study of all components of REE, it will be possible for those whose task is more limited to select from it those elements that are relevant to their needs. Because of the particular problems of those who undertake shorter term, less intensive diagnostic studies such as AID's Agricultural Sector Assessments, an appendix is attached suggesting techniques for abridging the manual.

These guidelines assume that its users have access to studies of the broader agricultural sector such as Agricultural Sector Assessments or the World Bank's Sector Studies. These provide REE study teams with an overview of the agricultural sector, including resources, geography, population, infra-structure, credit, marketing, and a host of other important topics which are critical to agricultural development, which contribute to the ambient within which the REE institutions must function, and which define the priority problems that the REE institutions must address. Knowledge of these

other components of the agricultural sector is essential both to identify the priorities for REE programs and to distinguish those agricultural sector inadequacies that have their roots in insufficient REE services from those which can be ascribed to weaknesses in other components of the sector. These guidelines assume that the study team has an in-depth understanding of the agricultural sector based on existing studies and prior experience in the country.

The title of this document, Guidelines for Assessing Agricultural Research, Education and Extension Programs in Developing Nations, should be taken quite literally. It is intended as a guide but not as a prescriptive manual. It is presumed that its users will view it as a starting point, as a suggestion of a logical procedure for accomplishing their assigned task. It must be their responsibility to modify and supplement it to fit their specific needs. It is purposefully vague in detailing procedures for data collection and analysis in recognition of the fact that the developing nations are quite heterogeneous, and, thus, no single set of procedures can be applied uniformly to all or even a significant proportion of these nations.<sup>1</sup> The study team must have the wisdom

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<sup>1</sup>An effort by BIFAD to address these needs resulted in the development of a Baseline Studies Field Manual (May 1978). This manual contains a wealth of information and ideas. The present Guidelines draw freely upon this Manual, and represent a modification and simplification of it. Field teams may wish to refer to selected sections of the Manual for detailed suggestions regarding analytical procedures.

and the flexibility to adjust to the particular setting.

Overview of these Guidelines. The methodology proposed in these guidelines incorporates what might be termed a "demand and supply" approach to the analysis of REE. Each of the following sections describes a chapter of a study report. In Chapter 1, the institutional components of REE are described and assessed including the dimensions of commitment and philosophy, structure and linkage, inputs, procedures and policy, leadership and outputs. In Chapter 2, the demand for REE services is described. In Chapter 3, output and demand for REE services are contrasted and explanations, termed constraints, are presented for any existing gaps. Existing policies and programs to eliminate constraints are described in Chapter 4. The last Chapter (5) contains recommendations for the elimination of these gaps.

#### DESCRIPTION OF EXISTING REE SERVICES AND INSTITUTIONS

##### (Chapter I)

Structure and Linkages. In this section, the various public and private research, extension, and education units should be described. The degree of detail presented will depend upon host government and USAID mission needs and available resources. For each of the elements of REE, an effort should be made to describe the official and informal administrative structure, including organizational diagrams and administrative flow charts. This

description should include both national level and (where appropriate) regional and local level organizations. In those situations in which there exists a dual economy comprising domestic food production on the one hand and export-oriented production on the other, it may be appropriate to describe and assess organizational structures along these lines. A similar dichotomy may exist between domestic subsistence production and domestic market-oriented production, or other meaningful distinctions may be apparent within a particular country. This description should include the formal organizational arrangements for coordination between the REE components. Discussions with officials at various levels of government, supplemented with field observations, will permit the making of judgments regarding any divergence between the formal and the informal administrative system.

Having described the formal and informal administrative structures for research, education, and extension, an effort should then be made to describe the informal linkages, both between the various REE institutions and between REE components and other organizations and client groups. The literature distinguishes four types of linkages: enabling, functional, normative and diffuse.

Enabling linkages are those which have a primary purpose of assuring the continuity of the organization through establishing successful claim on current and future resources. In the context of REE, enabling linkages are established with legislative bodies, other government offices, foundations, donor agencies, clientele groups and

other organizations which directly or indirectly influence resource allocations and policy and program decisions.

A second classification, closely related to enabling linkages, is normative linkages. There are the linkages with institutions which influence societal norms and values - religious groups and political parties for instance.

Functional linkages include the interactions between the various administratively distinct units of REE. There are two types of functional linkages, horizontal linkages between offices and agencies providing complementary services to a client group or similar services to different client groups and vertical linkages between those units that produce and those that utilize a given service. The linkages between research and extension offices are an example of vertical linkages. Vertical linkages also include the interaction between REE institutions and private sector users of the service, between extension and farmers organizations, and between educational institutions and agribusiness firms. Horizontal functional linkages typically are designed to facilitate coordination of programs while vertical linkages transmit outputs. Like a market, functional linkages also facilitate transmission of information regarding the quality and quantity of services desired by its users. Linkages also include relationships with external organizations such as the international research institutes.

The last category of linkages, diffuse linkages, represent the relationships with individuals not associated with an institution. In

this context, this may be interpreted to include the relationship with the general public, usually accessed indirectly through the media.

Linkages have four basic purposes: to obtain public and political support for REE institutions; to acquire financial support and establish policy for REE institutions; to establish complementary relationships with other REE institutions including exchange of services and information; and provision of services to final users. The linkage assessment should allow the team to conclude whether goals and purposes are adequately communicated from policy makers to the REE institutions; whether the needs for services are adequately being communicated to the service producers from the service users; whether services actually reach their intended users; and, where coordination or cooperation within the REE system could enhance its effectiveness, whether the necessary linkages actually exist. Obviously, the number of potential linkages is very large. It is, therefore, incumbent upon the research team to identify and assess only those linkages which are judged to be critically important. Key individuals can then be interviewed to identify gaps and to subjectively appraise the effectiveness of existing linkages.

Developmental Orientation of REE Institutions. In this section the purposes and goals of the REE institutions should be described. This section's fundamental objective is to assess the degree to which the goals and purposes of the REE institutions are to produce services which contribute to the progressive development of the agricultural

sector and to enhance the welfare of food and fiber producers and consumers. In order to assess the REE's developmental orientation, the team should determine how this society has resolved the following issues. Which groups in the society are the REE institutions serving? What services are the REE institutions providing? Who pays the costs of producing REE services? How consistent are the views of those who determine REE policy with those who administer and implement it?

To a large extent, this assessment must be subjective and qualitative. It must be based on a thorough review of formal goal statements as set forth at various levels of government--perhaps drawing from the National Development Plan, ministerial, departmental and other statements of goals and objectives. These may be supplemented by discussions and formal interviews with individuals at all levels of policy making and implementation. However, analysis of some quantitative data may also be instructive, particularly budgetary data. It may be possible to contrast the appropriations for REE with appropriations for other public services, and among the various REE institutions in order to obtain a rough measure of the priorities for REE. It may also be possible to classify REE appropriations by region, subject matter, or client groups.<sup>1</sup>

The determination of emphasis placed on certain regions or commodities can be very useful in assessing the more subtle aspects of public policy. In those countries where regions tend to be socially, economically, or agriculturally heterogeneous, comparison of expenditures by region or commodity may provide insight into the

implicit goals of REE. Similarly, emphasis on specific commodities in goals and objectives statements or appropriations may be indicative of support for particular groups of consumers or producers.

If those who provide the funds for REE have substantial influence on the direction and content of REE programs, then some attention to the source of funds for REE is appropriate. Where REE is funded by earmarked taxes or cesses, it can be anticipated that the groups paying these taxes will attempt to influence the use of funds to their own benefit. Similarly if large amounts of funds are contributed by international donor agencies, the policies of these agencies may be critical in the determination of the beneficiaries of REE.

A frequent problem which reflects a lack of understanding of the role and function of REE is the assignment of responsibility to the REE institutions for other service programs which conflict with the provision of REE services or, at a minimum, which compete for resources with REE services. For example, in some countries extension workers administer credit programs or regulatory programs which may inhibit their educational relationship with farmers. Similarly, assignment of responsibility to research agencies for producing plant materials (seeds or seedlings) for distribution to farmers may reduce the manpower, equipment and land available for research.

Another common problem which should be considered in this section concerns potential conflict between the goals and objectives enunciated at the policy-making level and the more personal goals of those who must implement those policies. Frequently, reward systems

do not adequately recognize public service or perhaps the cultural milieu even denigrates public service. Among researchers, this may result in emphasis on disciplinary research and publishing in professional journals<sup>1</sup> rather than on problem solving research. When Extension lacks a public service philosophy, one often finds an emphasis on bureaucratic role-playing as an avenue to professional advancement rather than a clientele service orientation with the result that inordinate amounts of time are spent designing programs, attending meetings and preparing reports. In the educational system, course content may tend to emphasize theoretical aspects without regard to applicability to local problems. In extreme cases, courses may replicate those taught in more developed countries, particularly at educational institutions in the country of the former colonial ruler.

Inputs. In the previous section of the report, it was suggested that an analysis of budgetary data be undertaken in order to assess the commitment to REE in general, the specific commitment to each of the three components of REE, and to draw inferences about the priorities within REE programs. In this section, the adequacy of the inputs made available to REE and the efficiency of their use should be assessed. Two techniques may be utilized: an analysis of budgetary expenditures for inputs, and a qualitative and quantitative assessment of specified critical inputs. Normally, the input categories should be disaggregated at least by function (Research, Education, and

Extension). In some countries, it may be considered desirable and feasible to attempt a further breakdown by clientele group, region, subject matter or other meaningful categorization. (See Appendix B for classification schemes). The study team must base this decision on its terms of reference, and feasibility within data constraints.

It may be possible to obtain expenditure data from the REE institutions. Because expenditures may vary from year to year, it may be advisable to analyze them for several past years. Analysis of budget projections may provide insight into perceptions of resource needs. Budgetary data should be analyzed to determine growth trends and availability of complementary inputs (seed and fertilizer, personnel and operating expenses, etc.) in order to identify major constraints and to design activities to alleviate these constraints. Some measure of efficiency should also be undertaken, such as cost per graduate, number of graduates per hundred students currently enrolled, average time to complete a particular educational program, administrative overhead as a proportion of total costs, number of extension employees per farmer and cost per farm visitation, operating costs per extension worker.

It may also prove to be useful to assess the quality and quantity of some of the more critical inputs. The primary input in all components of REE is personnel. Personnel may be assessed in terms of educational/training levels, disciplinary mix, experience, administrative vs program responsibility (headquarters vs field), technical competencies and other variables as deemed important in the

particular setting. Again, it may be desirable to further disaggregate these data beyond research, education and extension to regions, clients, subject matter or in other ways as illustrated in Appendix B.

Other inputs which may be important include libraries, buildings, laboratories and laboratory equipment, classrooms, research farmlands, demonstration plots, school gardens, vehicles for extension workers, and farm equipment and implements. The selection of inputs for assessment should be based on the nature of the programs being undertaken or proposed. To a large degree, the evaluation of the quality and quantity of physical inputs must be subjective and will require on-site inspection by the team. A report that states that an agricultural secondary school has 5,000 books and 25 periodicals may be very misleading if 95 percent of the books were published before 1960 or are novels and all but two of the periodicals are unrelated to agriculture. A list of some key inputs is presented in Appendix B.

Operating Procedures and Program Management. In this section, it is important to develop an understanding of the program planning and implementation processes, including ways in which priorities are established and resources allocated among competing areas. Are programs designed centrally, at the local level, or some combination of the two? Are there, for example, mechanisms for the formal participation of client groups in the design or approval of specific research, education, or extension activities? Are resources allocated

according to some arbitrary formulas or according to priorities and program needs? Is the commodity procurement system organized in a manner consistent with timely delivery of quality goods and services at reasonable cost? It is these and similar questions that should be answered in order to appraise the internal operating efficiency of the REE system.

The team should also review personnel policies regarding recruitment, hiring, tenure, promotion, salary structure, incentives, and opportunities for professional improvement (in-service training, long term professional training, sabbaticals, support for attending professional meetings). This may entail studying the civil service system. Although there usually is a general recognition on the part of government administrators of deficiencies in these areas, often the extent to which these deficiencies can constrain a total program is not fully appreciated. Such an analysis in cooperation with an outside group (USAID study team) may prove to be more effective in inducing change in key administrative areas than would a purely in-house review by entities of the host government. All of these variables should be investigated for each relevant sub-category of the REE system.

Leadership. Although leadership is perhaps the most difficult dimension of REE to assess, and certainly is the most sensitive element its central role in any institution mandates its consideration. Leadership had three major functions: to be aware of the

changing social, economic, and political environment and to communicate to the institution the programmatic implications of these changes; to acquire resources for the institution; and to allocate financial, physical, and human resources in such manner that programmatic goals are effectively and efficiently attained.

It is obvious that it is difficult to measure the effectiveness of individual administrators in fulfilling their responsibilities, both because measurement is difficult and norms are unavailable. Hence, the analysis must consider some proxy variables for assessing leadership quality and must be based on subjective appraisal. Among those that may be selected are training and experience of administrators at all levels, criteria for selection, innovativeness of approaches to problem solving as indicated by allocation of personnel and funds, method and effectiveness of communication between management and staff, and respect given to key leaders by the public and by their staffs.

Output of Services. Ultimately, the most appropriate measure of the effectiveness of the REE institutions is change in resource productivity in the agricultural sector. Through use of econometric methods the effects of REE and other public and private investments can be distinguished. There exists a substantial literature on such studies which should be reviewed by teams contemplating using this approach. For those which lack the resources, time, or data to undertake such a study, a more mundane, less rigorous approach is

suggested here. The procedures outlined in the following paragraphs could also supplement an aggregate econometric assessment.

Both a quantitative and a qualitative assessment should be made of the outputs generated by the REE institutions. The primary purpose is to determine: (a) the volume of output of each program or service, (b) the utility of the outputs to users, and (c) the client groups which are being served. Sources of information may include (a) records and publications such as curricula, graduation lists, graduate follow-up studies, research publications, experiment station project descriptions and annual reports, and extension publications, program descriptions and plans, (b) interviews of those who implement and manage REE programs such as teachers, researchers, and extension workers, and (c) interviews of users or potential users of REE services, graduates and employers, extension program planners, and farmers.

The approach taken will differ somewhat for research, education and extension. For the education component, for example, it would be useful to determine the number of graduates over the most recent 5-10 years, by discipline and level of education. Quality assessments may prove quite difficult to make, but are very important in assessing how well the system is functioning in terms of meeting the needs of its clientele. The team may develop a "feel" by interviewing faculty members, employers, and recent graduates, to solicit their evaluations. Curricula and the performance of graduates on the job may be reviewed. Demand for graduates may to some extent provide a

proxy measure of quality. It is important that the team reach a judgment as to whether the education component is adequately servicing the needs of the other components of the agricultural sector for trained human resources.

Similar measures and methods may be developed for extension programs to determine the substance of knowledge being transmitted and its usefulness. Content of programs may be assessed through reviewing printed materials, program descriptions, radio program scripts, etc., and interviews of extension personnel. Their utility may be appraised through interviewing client groups and analyzing aggregate input and output data to determine whether recommendations have been adopted. Attention should be given to determining where there are gaps in meeting the needs of the various client groups. Explanations for the clientele's rejection of recommendations should be sought in order to discern whether the fault lies in the delivery process or in the underlying research.

Research output should be assessed to determine the extent to which new and useful knowledge is being generated, tested, and made available for dissemination to users. The team may be able to compare average prevailing yields of major commodities with yields at research stations, on supervised regional field trials, and on cooperating farmers' fields. This will provide one estimate of the availability of improved technology. A cataloging and assessment of current research projects and research publications provides other insights into areas of emphasis and research productivity. Field observation

and discussion with both producer groups and extension workers can further round out the assessment of availability and usefulness of new knowledge.

By coupling attempts at quantification with judgment of experienced observers, it should be possible to develop reasonably reliable estimates of the adequacy of the outputs being provided by the various REE component, and to identify some of the major areas of weakness both within the individual components and between the components of the system.

## CURRENT AND FUTURE DEMAND FOR REE SERVICES

### (Chapter 2)

Introduction. In this chapter, current and projected requirements for REE services should be outlined. Of the many alternative investments in programs of education, research, and extension, which ones, in the judgment of the analysts, have the highest potential return to society as a whole? The conceptual framework for such an analysis is benefit-cost analysis. If formally carried out, it will require estimating the economic benefits to society as a whole of each possible investment, and estimating the costs of each investment. Benefits must be discounted to the present and contrasted with costs to identify those investments which provide the highest return. This technique presents, however, many problems

which makes it difficult to utilize in this context. Prices of outputs and costs of inputs must be projected over time. Some possible investment benefits do not lend themselves to measurement in monetary terms - formal education and social science research present the most difficult problems in this context. Research is a risky affair and subjective probabilities of success must be determined and incorporated into the estimate of benefits. Possibly the most important limitation of benefit-cost analysis is that it does not provide insight into the achievement of policy goals other than growth, such as income redistribution, employment, foreign exchange earnings, and adequacy of food supplies. Nevertheless, whether used explicitly or as a conceptual framework for underlying a less rigorous analysis, benefit-cost analytical concepts should be used, supplemented by consideration of impact on other policy objectives.

Few countries, whether more developed or less developed, have carefully assessed their needs for REE services. Hence, the REE study team will have to depend on such information sources as agricultural sector assessments, manpower studies, the views of informed observers, trends, and ultimately their own professional judgment, experience, and knowledge of agriculture. It is critical that in the process of arriving at these judgments, team members spend a substantial amount of time at the field operations level, observing and discussing needs with both technical personnel and their client groups.

Educational Needs. The demand for educational services takes the form of a demand for new graduates with education in agriculture for employment in both the private sector and the public sector, including the REE institutions themselves. In the private sector, any analysis of demand for new graduates should include the needs of input supply firms, commercial farms, and marketing firms. Aside from the REE system, the public sector includes other elements of the Ministries of Agriculture and Education, and any semi-autonomous agencies such as marketing boards. In order to be of greatest utility, the demand for new graduates should be disaggregated by degree level and discipline or specialty. Special characteristics such as rural background or prior farming experience might also be noted.

Future demand for trained agriculturalists depends on changes in total employment of agriculturalists and the rate of death, retirement, and resignation. Changes in total number of positions for agriculturalists is influenced by both the state of the economy and plans for government program development and staffing. With commercialization of agriculture, the requirement for more highly trained personnel increases. With growth in revenues and expenditures, public sector employment of agriculture graduates usually increases. The replacement market for new graduates also creates analytical problems. It depends on the rate of retirements, which in most countries is relatively predictable. But in those cases where, due to low salaries, poor working conditions, and political

instability, professionals leave the industry in substantial numbers, the potential for changes in these conditions must be considered.

Unless detailed studies have already been carried out, it is unlikely that the team will be able to develop very precise demand projections in which they have an acceptable level of confidence. Although time and resource constraints may not permit much primary research, the team should nevertheless attempt to arrive at some simple projections based upon their experience and whatever information can be accessed.

Research Needs. An assessment of research needs is difficult and to a large extent judgmental. Using data generated in Chapter 1 of the study, coupled with constraints identified in other studies of the agricultural sector, and sectoral goals delineated in the country's five-year development plan, it should be possible, however, to begin to develop broad categories of priority needs. The approach taken will necessarily vary by country; in some, it may be meaningful to begin with categories such as domestic food crops vs. export crops or crops vs. livestock. Within these, one could then develop priorities by individual crop or livestock class. In other countries, it may be more meaningful to approach the analysis in terms of discipline-specific problems: soil fertility, plant protection, plant breeding, animal disease control, etc. In others, economic, political, or social considerations may require a focus upon particular research investments in terms of overall development goals,

the likelihood of obtaining positive results and the time required, the estimated value of those results, and the costs associated with achieving them. It is unlikely that it will be possible to make a very precise estimate of the costs and benefits of alternative research programs and to calculate reliable internal rates of return or B/C ratios. However, at a minimum, alternatives should be grouped by priority.

Extension Needs. In assessing opportunities for high payoff extension programs, emphasis should be placed on determining the existence of knowledge which has not been put fully into practice. This may require identifying fully tested research results which have not yet been extended or adopted, and major differences in adoption among client groups or geographic areas. However, judgment must be exercised to ascertain that the adoption rates reflect lack of knowledge rather than other intervening variables such as low profitability of the innovation, poor access to input markets, capital constraints, land tenure policies, lack of local markets, etc. Consideration must also be given to forthcoming research program results. A categorization according to priority, and structured around subject matter, region, and clientele group would provide a useful representation.

## CONSTRAINTS TO THE PROVISION OF REE SERVICES

## (Chapter 3)

In the preceding chapters, the output and the needs for REE services have been described. In this chapter, these will be contrasted in order to identify current and likely future shortfalls in their quantity or quality. The description of the system provided in Chapter 1 will provide a basis for identifying major constraints to the production of REE services. This, then, becomes the basis for developing recommendations for change and for identifying a strategy for strengthening the REE system.

The discussion of each REE component (research, extension, and education) should contain an appraisal of its current and likely future capacity to produce the services demanded of it and an explanation of any current or projected shortfalls based upon the description of the REE. Weaknesses in the REE institutions causing shortfalls (as opposed to external factors) are the constraints which may be addressed in future programs or policy changes. Fundamentally, shortfalls are of two types: an inadequate quantity, quality of services, and failure to deliver services to its users (absence of linkages).

Inadequate quantity of research would be evidenced by lack of research on a key problem of agricultural development; for example, lack of any organized program of research on the nation's food staple or largest agricultural export crop, or lack of a plant breeding program for a major source of vegetable protein. Lack of sufficient quality may be evidenced by inappropriate research objectives, poor

mix of disciplines addressing a particular research problem, or poor research design.

Inadequate quantity of extension services may be reflected in lack of services to particular client groups or regions, or lack of extension programs in important subject matter areas. Lack of quality would be largely reflected by the client's failure to adopt extension recommendations.

In education, inadequate quantity refers to a shortage of graduates at a certain degree level with specific subject matter training (Ph.D. agronomists; B.S. animal scientists, etc.). This would be evidenced by unfilled job openings or hiring of individuals with inappropriate educational backgrounds. Inadequate quality, a more subtle problem, is caused by educational programs that do not prepare graduates to fulfill reasonable expectations of entry-level employers. An example would be Ph.D. researchers whose research interests are largely disciplinary who require the access to equipment that is beyond the resources of the country to provide or who lack the scientific and theoretical knowledge to undertake well-designed research.

The constraints underlying shortcomings in the quality and quantity of services may be deduced through a review of the description of the REE components. Care must be taken, however, to distinguish between those shortcomings which are caused by the REE institutions themselves and those which have external origins. For instance, it may be that farmers are not adopting a particular crop

variety recommended by extension, because seed that is produced in the private sector is in short supply. Alternatively, a recommended imported chemical may be unavailable because of foreign exchange restrictions. It may be found that there are serious difficulties encountered in retaining the services of senior professionals because of noncompetitive salary structures imposed by the civil service system. Although these are significant constraints which must be explicitly recognized and documented, they should be carefully distinguished from those which are internal to REE.

#### EXISTING PROGRAMS AND POLICIES TO ELIMINATE CONSTRAINTS

##### (Chapter 4)

It would, indeed, be unusual to find a nation that is not undertaking some efforts to strengthen its REE system. This may take several forms: restructuring of the system or its components; changes in the total budgets allocated to the REE system; reallocation of resources within the REE system in order to improve the input mix; revision of administrative policies and procedures; upgrading professional staff through in-service training or new hiring; and establishing new institutions. These efforts may be mounted entirely with domestic resources or may involve the assistance of external donors. In this chapter, such activities should be reviewed.

A convenient method of presentation is first to delineate recent and current program policy innovations and resource reallocations which do not involve external donors and then to describe the activities which involve collaboration with donor agencies.

This review will permit a determination of which constraints are being addressed and which are not, and will permit design of a strategy and specific projects which complement and build upon existing projects and new policy directions. The review should be presented in a logical framework format to the extent possible, should include an annual schedule of investments (inputs), and should identify relationships to the constraints discussed in the previous section.

## RECOMMENDATIONS

### (Chapter 5)

Introduction. In previous chapters, prioritized needs for services produced by the REE system have been identified and the degree to which these are currently being fulfilled has been assessed. Constraints to a higher level of performance have been identified and efforts to eliminate the constraints have been described. With this information, means for eliminating those constraints not already being addressed can be designed. Two steps are required: design of a long term plan of sequenced and complementary activities to eliminate the

remaining constraints; and delineation of a series of projects which incorporate this strategy into packages which may be implemented by the host government with the collaboration of AID and other donors.

Strategy for REE Development. Strategy, in this context, simply refers to a long-term plan of sequenced and coordinated activities to eliminate identified constraints. It must be long term for at least two reasons. The most obvious is that most countries confront resource constraints which make it impossible to simultaneously carry out all the activities necessary to strengthen the REE system. More crucial, perhaps, are the constraints imposed by the temporal interdependence of the activities. For example, where there is no on-going research program in a key crop because there is an insufficient number of research scientists trained for work with that crop, there is no point in immediately building new research facilities or establishing an extension program for that crop. Because of these interdependencies and the relatively long periods required to produce some of the key inputs, particularly human resources, a strategy must have a relatively long-time horizon, usually ten to twenty years.

The first step in designing a strategy should be identification of the outputs desired from each element of the REE system at the end of the plan's time horizon. This should be based on the description of the demand for REE services discussed in Chapter 2. This, in turn, will provide the basis for the next step, estimating the level of

resources required to produce those outputs. At this stage, it will not be possible to itemize a complete set of inputs for the entire time span; however, a rough approximation of the magnitudes in as much detail as is realistically possible will be extremely useful. Equally important is a description of the institutional structure that will be created over the planning period. The final step is to delineate and cost out the sequence of activities (or actions) which must be undertaken to achieve the long term output goals. Five types of activities will comprise the components of the plan: institutional development, policy change, training of human resources, acquisition of physical resources, and technical assistance. To simplify the planning process, each component of the REE system should first be considered separately. Their interactions can then be considered, and the sub-system plan integrated. These steps may have to be completed iteratively until a plan is devised which is sequentially and budgetarily feasible.

Project Descriptions. Once a phased strategy for strengthening the REE system has been designed, the next step is to partition the various activities into projects. Obviously, this implies a series of projects over time in accordance with the phased plan with one or more projects for any given time span. Initial projects should be described in substantial detail, while projects that are to come on-stream in successive time periods need only be outlined generally. The description of projects over the length of the planning period

should include a general description of their purposes, outputs, inputs and beneficiaries. The relationship to the strategy should be explained. Implementing mechanisms should be described only to the degree necessary to convey the substance of the project. A rough approximation of costs, at current prices, will facilitate long term budgetary planning for the government and donors.

More detailed descriptions consistent with Project Identification Document (PID) format of the first phase projects will facilitate rapid implementation of the plan. All elements of the PID which can be drawn directly from this study should be essentially complete. Only those segments which require substantially new analysis should be left for completion by the USAID mission and host government at a later date.

## Appendix A. Guidelines For Implementation

1. Pre-departure Arrangements. Careful preparation prior to actual field work is critical to success. This should include an orientation followed by an opportunity to review written materials on the country in question. Arrangements should be made in the field for assignment of counterparts and the collection of relevant data prior to the arrival of the full team. Provisions should be made for selected host country officials to come to the U.S. and participate during this preparation period. The Team Leader of the expatriate team should arrive in the country 2-3 weeks in advance of the full team in order to make arrangements for logistical support, USAID and host government contacts, and to establish a tentative work schedule.
2. Team Member Assignments. Team assignments should be made along institutional lines (research, extension, education) rather than according to discipline. The latter approach fails to address the broader conceptual issues, and reduces the potential for integrating the study.
3. Previous Experience. An important factor contributing to the success of the team is prior international experience, preferably in the country to be studied. This includes language competency and conversancy with the present and historical social, political, and economic milieu. At least some of the team members should meet this criterion. Perhaps a more important, but less tangible, criterion is the ability to work outside of the confines of discipline and prior institutional role.
4. Counterparts. Both the quality of the study and the likelihood of acceptance of the recommendations is enhanced when full counterparting is accomplished. Counterparts preferably should include members from among the decision-making strata, and should participate in all phases of the study, including conceptualization, design, implementation, drafting, and final presentation.
5. USAID Mission Support. AID/Mission support is critical, particularly when the team has had limited prior experience in the country, to assist in articulation of major issues, to provide access to key individuals, and to assist the team in understanding the political realities of the particular country.
6. Allocation of Team Inputs. The quality of a baseline study and the resources devoted to it are clearly related. It appears that one person year is a minimal investment, allocated in roughly the

following proportions:

|   |             |
|---|-------------|
| Predeparture activities (orientation, team preparation,<br>field preparation) | 4- 6 weeks  |
| Data collection and site visits   | 35-40 weeks |
| Report preparation  | 7- 8 weeks  |
| Report review and revisions   | 4- 8 weeks  |

These would vary with the composition and prior experience of the team, the size and complexity of the country, and the level of host government and USAID mission support.

## Appendix B. Alternative Schema for the Categorization of Data

Depending upon the level of detail desired in a specific country study, the availability of data, the problem of set confronted by the REE institutions, and the stage of development of the REE institutions themselves, data may be analyzed at various levels of disaggregation. Moreover, it may be useful to disaggregate available data into rather fine groups for one purpose but hardly at all for others. The following suggests alternative schema for such disaggregation.

### I. Functions

- A. Research
- B. Extension
- C. Education

### II. Subject Matter

- A. Resources
- B. Production
- C. Distribution
- D. Consumption
- E. Policy

or

- A. Resources
  - land
  - water
  - climate
- B. Commodities
  - crop 1
  - crop 2
  - crop 3
  - Secondary crops
    - livestock 1
    - livestock 2
  - Secondary livestock
    - fisheries
    - forestry
    - other 1
    - other 2
- C. Management, Technology, and Credit
- D. Distribution
  - processing
  - storage
  - marketing
- E. Social and Cultural Constraints
- F. Public Policy and Planning

### III. Clientele

- A. Youth
- B. Farmers - male and female
  - export producers
  - subsistence producers
  - domestic commercial producers
  - or
  - food and producers export
  - raw materials producers
  - food producers domestic commercial
  - local market/subsistence producers
  - or
  - small farmers
  - medium size farmers
  - estates
- C. Landless Farm Laborers
- D. Homemakers
- E. Consumers

### IV. Institution and Agency

- A. University
- B. Secondary School
  - 1.
  - 2.
  - 3.
- C. Extension Service, MOA
- D. Research Service, MOA
- E. Export Crop Marketing Board Research Division
- F. Export Crop Marketing Board Extension Division, etc.

### V. Regional

- A. Region 1
- B. Region 2
- C. Region 3
- etc.

### VI. Discipline

- A. Agronomy
  - 1. Crops
  - 2. Soils
  - 3. Plant Pathology
- B. Livestock
  - 1. Nutrition
  - 2. Physiology
  - 3. Management
  - 4. Veterinary Medicine
- C. Food Technology
- D. Engineering
- F. Horticulture

- F. Entomology
- G. Forestry
- H. Fisheries
- I. Economics
- J. Sociology
- K. Nutrition/Home Economics

VII. Inputs

- A. Personnel
  - 1. Ph.D.
  - 2. M.S.
  - 3. B.S.
  - 4. Secondary
  - 5. Diploma
  - 6. Certificate
  - 7. Other
- B. Land
  - 1. Irrigated
  - 2. Non-Irrigated
  - 3. Drained
- C. Buildings
  - 1. Offices
  - 2. Laboratories
  - 3. Barns
  - 4. Repair Shops
  - 5. Classrooms
  - 6. Libraries
  - 7. Greenhouses
  - 8. Maintenance
  - 9. Storage
  - 10. Housing
- D. Equipment
  - 1. Laboratory
  - 2. Data Processing
  - 3. Printing
  - 4. Vehicles
  - 5. Farm Machinery and Tools
  - 6. Audio-Visual
  - 7. Books
  - 8. Draft Animals
  - 9. Experimental Animals
- E. Expendable Supplies and Services
  - 1. Seeds
  - 2. Fertilizers
  - 3. Chemicals
  - 4. Office supplies
  - 5. Telephone
  - 6. Gasoline
  - 7. Travel Budget

### Appendix C. Suggested Approach to Diagnostic Studies

One possible use of these Guidelines is as a conceptual framework for host government and AID mission personnel conducting a relatively brief review (one or two person weeks) of REE to assess the need for a more intensive study or for other purposes. Although the broad conceptual framework remains appropriate to this use, major components can be eliminated for the purposes of a diagnostic study. A diagnostic study need only determine whether there exist significant gaps in the services being generated by the REE institutions and, if so, identify hypotheses explaining the sources of the gaps. This information then can be utilized in preparing a scope of work for a study team and may guide the study team's planning of data collection and analysis. A Diagnostic Study should contain the following three sections.

- I. Current and Future Demands for REE Services
- II. Current Outputs and Gaps in REE Services
- III. Hypothesized Constraints to Increasing the Flow of REE Services

Section I should be based on existing knowledge of the agriculture sector as reflected in published materials, government reports, interviews of knowledgeable individuals, and the informed judgment of the individuals preparing the report. Services should be described in terms of education by degree level and area of specialization, research products by commodity or problem area and extension services in terms of program content and number of clientele reached.

In Section II, current and short term future outputs of the REE system should be described. The information required for this section may be obtained by interviewing informed individuals, from published reports and government documents.

A second component of this section should be a comparison of outputs and needs. This will have been facilitated if demand and outputs have been described in similar units. They should be presented in terms of the three functions, research, education, and extension and within these subject matter areas, degree levels, regions, or similar categories.

In the final section of the diagnostic study, hypotheses as to the constraints causing the observed gaps between output and need should be presented. In order to generate these hypotheses consideration should be given to commitment, structure and linkages, inputs, leadership, and policy and procedures, the components of Chapter 1 of the guidelines. These hypotheses may be derived from personal judgment and observation as well as interviews with other informed individuals.