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# Reviewing Agricultural Research Systems

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**Abstract:** A sizable literature on quantitative research evaluation procedures has developed, but little attention has been focussed on procedures for reviewing or monitoring agricultural research in an external review process. Despite their relative neglect in the literature, external reviews are increasingly relied on by governments and by international donor and lending agencies to assess the performance of research systems. This paper suggests guidelines for external reviews, focussing on their content and procedures, while highlighting key issues with respect to research organizations; discusses the importance of obtaining early agreement among review team members on evaluation criteria and of considering research system goals, objectives, priorities, organization capacity, management, vertical and horizontal linkages, programme content, impacts, and future needs; examines the issues of linkages between national research systems and the international agricultural research centres and the extent to which national systems should adopt a farming systems research approach; and stresses the need for the research system, operating in an uncertain world, continually to reassess the long-run demand for particular technologies.

## Introduction

The importance of well-functioning national agricultural research systems for improving agricultural productivity has become increasingly recognized in developing countries and among foreign assistance agencies. Data for the 1970s indicate that substantial real growth has occurred in many national agricultural research systems (Oram and Bindlish, 1981). Nonetheless, support for agricultural research has varied markedly among Third World countries, and even those that have strongly supported research have felt the need to justify their research programmes. As a result, research evaluation efforts have increased, and a sizable literature has emerged on methods for quantitatively assessing research benefits (Evenson, Waggoner, and Ruttan, 1979).

While the literature on quantitative research evaluation procedures has grown, little attention has focussed on procedures for reviewing or monitoring agricultural research systems or institutes in an external review process. The one major exception is the article and chapter by Ruttan (1978 and 1982). Despite their relative neglect in the literature, external reviews conducted by teams of five to eight scientists are a common procedure for monitoring agricultural research programmes. Many donor and lending agencies, such as the World Bank, FAO, and USAID, increasingly rely on those reviews to assess the performance of research systems that they support.

Ruttan (1982) points out that the results of external reviews of agricultural research systems are often regarded as unsatisfactory by both the members of the review team and by the management and staff of the research institution. He suggests several reasons for that and provides general guidelines for improving review procedures. The purpose of this paper is to suggest additional guidelines for external reviews. It focusses on the content and procedures for national agricultural research system reviews (NARSRs) and highlights key issues with respect to research organization.

## Content and Procedures for NARSRs

One of the features that distinguishes NARSRs from similar activities, such as peer reviews of research projects, is the breadth of the assignment. National agricultural research systems typically encompass a wide variety of public research programmes; interface with extension and education activities, private research programmes, and international agricultural research centres; receive support from bilateral and multilateral foreign assistance agencies; and operate under a diverse set of agricultural production constraints. The scope of a NARSR may include an examination of only part of the system but often involves both overall and component assessments. Consequently, NARSRs are usually conducted by teams that bring together a variety of skills related to crops, livestock, research management, extension, and socioeconomics. Because several sources provide financial support to the research system, team members may represent a mixture of bilateral and multilateral assistance agencies as well as host-country institutions. Because of that heterogeneous composition of the team, the selection of a team leader with strong organizational and management skills is of major importance. The leader should help select the team and assess comparative advantages of its members in terms of verbal and writing skills, knowledge of the host country, and other areas beyond subject matter expertise and should become familiar with reporting expectations of individual agencies and institutions providing the team members.

A minimum of five to eight weeks is required for an external research system review. Efforts by team members to collect information and by the host country government and assistance agencies to prepare materials in advance of the team arrival are extremely valuable. Topics to be covered in the review itself will vary, but the team should initially consider the breadth of topics that might be covered in a relatively complete assessment and then refine the outline to the requirements of the particular assignment. The rationale for that approach is that the terms of reference provided to the team may be subject to multiple interpretations. One needs to obtain early agreement on the scope of the review and to ensure that important topics are not omitted. A tentative outline for the written report should be agreed on by the team and discussed with the appropriate representatives of supporting agencies and institutions. Every effort should be made to uncover hidden agendas that otherwise may not surface until a draft of the report is presented.

A relatively complete NARSR must consider the following:

- *Criteria.* A consensus should be reached between the team and the management of the research system or institution at the start of the review on the criteria against which the components of the agricultural research programme are to be evaluated. Ruttan (1982) stresses that point, and it is crucial to a satisfactory review. Examples of criteria are past or potential performance, future needs, maximum return to scarcest resources, distributional impacts, and other countries' performances.

- *Goals, objectives, and priorities.* These, as they apply to the agricultural research programme, must be elicited and questions asked to determine how they are set and how well they are recognized throughout the system. An assessment should be made of their appropriateness, given the size, stage of development, apparent needs, and social demand for new knowledge and technologies.

- *Organization and capacity.* An important set of issues surrounds the current research organization and capacity of the system being reviewed. The review team will generally collect information on research staffs, facilities, equipment, operating budgets, locations, scales, and coordination. The adequacy of those components depends on the country's stage of development, size, and resource base as well as the political, cultural, and economic system. The components have been shaped by historical forces that may constrain future directions. On this aspect of the review, disagreement among team members and between the team and research system managers and staff is likely because few sound, universally applicable guidelines exist for determining the appropriate location, scale, and other components of a research system and because the donor and lending agencies tend to promote particular approaches somewhat uniformly around the world at a particular time. If one agency views farming systems research as important to technology generation and adoption, attempts are made to standardize and encourage its use in every country. If another agency views the training and extension system as appropriate for encouraging adoption of research results, it too promotes it uniformly. At times, cross-country differences, not only with respect to climate, terrain, politics, culture, and country size, but particularly with respect to stage of research system development, are given little recognition. For example, one might hypothesize that extensive on-farm research trials on small farms scattered throughout the country may be appropriate in countries where relatively well-trained staff exist and where experiment stations are relatively well developed and are producing component technologies but where research is nonetheless failing to meet the needs of many small farmers. But in other countries where staff and other resources are scarce, and where experiment stations capable of producing component technologies do not exist, one would be wise to build a research infrastructure before spreading the system out too much. Otherwise, all financial and human resources may be exhausted before any progress is realized. Those are only hypotheses, but the appropriate research organization and capacity for a particular country at a particular point in time must be considered in the context of both cross-sectional as well as stage-of-development factors.

- *Management.* Most NARSRs consider research organization and capacity, but the degree to which research management issues are examined varies from one review to another. However, management issues involving planning, implementing, and monitoring are critical to effective functioning of research institutions. How open is the planning process? Are salary, promotion, and other incentives being used to signal to researchers the value of the most important research activities? What are the internal procedures established within the system or institute for monitoring and evaluating agricultural research on a continual or periodic basis?

- *Linkages.* The review team will be faced with a complex set of vertical and horizontal linkage issues. How do farmers make their needs known to researchers and acquire research results? How do researchers in field stations interact with those in central research stations? How are researchers

linked to extension workers? How does the national institution interact with the international agricultural research centres? What is the linkage between government and university research and teaching? What is the relationship between public and private research? The most important linkage issues for particular countries depend on country size, whether research and extension are in the same organization, the amount of interministerial planning, and other factors.

■ *Current research programmes.* Much of a NARSR will focus on the quantity and quality of the current research programme in such areas as plant and animal breeding, soil and water management, farming systems, forestry and fisheries, and socioeconomics. Research programme components must be considered individually if the review is to prove useful. Much time will be spent visiting individual scientists and observing their work at research stations. Care must be exercised not to concentrate too closely on research methodology of individual researchers but rather to spend adequate time on the research programme design. Are major gaps apparent in the programme? Is a “proper” balance attained? In most less developed countries, that balance will lean heavily towards applied and adaptive research with maximum borrowing of more basic research from other countries. The smaller the country, the more that is likely to be true.

■ *Impact assessment.* Once the research programme is examined, pressure may rise to quantify its impacts on production, distribution of benefits, employment, and nutrition. The extent to which those types of analyses are conducted should be decided upon when the evaluation criteria are established. Time constraints usually preclude quantitative impact assessment in a NARSR (e.g., calculation of consumer-producer surplus or rate of return to research), although those are occasionally requested. Such quantitative assessments are better left for separate in-depth analysis. However, one can frequently draw conclusions on relative impacts based on economic theory. The review team must consider major constraints facing agricultural production in the country and strategic long-term issues facing the research system. An assessment of the long-term (5-25 years) demand for research knowledge and new technologies is important because results that are not demanded have little impact.

■ *Current and future needs.* A key component of a NARSR is the assessment of current and future needs of the research institution with respect to research coverage, organization, management, facilities, training, and funding. The ultimate success of the review effort rests with host-country acceptance (and perhaps by assistance agencies) of the team’s recommendations on current and future needs. Consequently, the team should begin to formulate recommendations by the middle of the visit, write at least two drafts of its final report before leaving the country, and discuss its recommendations with key decision makers. Writing time should therefore not be allocated only in the last week of the review.

### Key Issues

Basic components of a typical agricultural research system review are described above and several others touched upon. Three issues deserve additional discussion: the linkage between national research systems and the international agricultural research centres (IARCs), the extent to which national systems should adopt a farming systems research approach, and the need for a unifying theory to guide how research systems should function.

The IARCs were established to generate new technologies, train scientists, and demonstrate the impact of agricultural research to policy makers (Coulter, 1983). Much of their early efforts were concentrated in breeding programmes at the centres. Over time, IARCs have broadened their involvement in direct technical assistance to national systems, in some cases assigning scientists to assist in specific national programmes for a specified period of time, which can be very positive for national systems because of the potential for improved training, adopted technologies, and education of policy makers is greatly enhanced. For a relatively small outlay, a national system can acquire basic knowledge and technologies that cost the international centres millions of dollars to produce. At the same time, the centres can distribute breeding materials at an earlier stage, with more adaptive research occurring in the national research programme. The movement towards greater national system involvement by IARCs is healthy for another reason. Many of the “easy” gains from improved irrigated rice and wheat varieties have been realized, and more attention must now be focussed on rainfed crops, livestock, and farming systems. Those activities are less transferable across geographic boundaries than irrigated rice and wheat varieties. Increased IARC involvement in national research is predicated, however, on the existence of viable national research institutions.

One of the problems in many African as well as in certain Latin American and Asian countries is the lack of basic research infrastructure. In many cases, a review team must assess which factors are hindering linkages between the national system and the international centres.

A related issue is the extent to which national systems should adopt a farming systems research approach. A NARSR will grapple with the important question of appropriate research programme design. Should the national institution develop commodity programmes for rice, wheat, potatoes, or beans? Should it take a farming systems approach? Or should it adopt a combination? How much attention should it devote to surveying problems of farmers in various geographical areas of the country? What proportion of the experimental trials should be conducted on-farm as opposed to on the research station? In many cases, a combination of systems and commodity approaches will increase the likelihood that the marginal dollar will be spent where it receives the greatest return.

Frequently, component technologies can best be developed in highly controlled on-station experiments. Furthermore, commodity programmes may facilitate low cost technology transfer from IARCs or from other national research systems. In many cases, however, complex problems can only be solved through a holistic approach that examines physical, biological, and human constraints and the interactions among the components of the farming system, followed by on-farm experiments. The criticism that this latter approach can absorb the entire national research system budget just identifying problems and thereby leaving no resources for solving them has some validity. However, overemphasis on producing component technologies without adequate study of the system can result in technologies that are not widely adopted because they fail to consider important aspects of the problem. In most cases, the solution lies on the middle ground. An external review team must decide where that middle ground lies for the country being studied.

External reviews are open to criticism because of their subjectiveness, brevity, and frequent lack of attention to strategic considerations affecting the research institution. While anecdotal evidence exists that well-organized reviews have caused invaluable introspection on the part of administrators and staff in research institutions, many reviews likely have had little tangible effect other than to meet the evaluation requirements of international assistance agencies. That situation will continue in the absence of a unifying theory to guide how a research system should function. Such a theory would have to be broad enough to recognize historical, cultural, climatic, topographical, educational, size, political, and economic differences across countries as well as the long-term nature of research. That may be asking too much, but the suggestions for NARSR procedures and content provided in this paper hint at some of the important aspects of a unifying theory. The research system should operate with well-defined goals, have a mechanism for periodically reassessing priorities, and make maximum use of complementary linkages among international research centres, indigenous research stations, on-farm research and extension efforts, and private research. Little technology will transfer from international centres, and few useful research results will be obtained from on-farm trials without indigenous research stations being staffed with researchers with adequate incentives to be productive. Finally, a research system must continually consider the long-run demand for new technologies as it attempts to increase their supply.

#### Note

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