

**A METHODOLOGICAL FRAMEWORK
FOR ISNAR REVIEWS
OF NATIONAL AGRICULTURAL
RESEARCH SYSTEMS
(NARS)**



International Service for National Agricultural Research

The International Service for National Agricultural Research (ISNAR) began operating at its headquarters in The Hague, Netherlands, on September 1, 1980. It was established by the Consultative Group on International Agricultural Research (CGIAR), on the basis of recommendations from an international task force, for the purpose of assisting governments of developing countries to strengthen their agricultural research. It is a non-profit autonomous agency, international in character, and non-political in management, staffing, and operations.

Of the thirteen centers in the CGIAR network, ISNAR is the only one that focuses primarily on national agricultural research issues. It provides advice to governments, upon request, on research policy, organization, and management issues, thus complementing the activities of other assistance agencies.

ISNAR has active advisory service, research, and training programs.

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STAFF ADVISORY COMMITTEE ON PROGRAMS

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Isnar

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Chapter 1. Introduction

A methodology consists of a specific set of procedures that are employed with regularity and are likely to achieve similar or comparable results each time they are employed. They are therefore *steps* which are specified or required to achieve a set of goals. ISNAR is moving towards a more focused methodological framework in its reviews of national agricultural research systems. Our purpose is to develop a methodological framework that furthers the goal of effective and efficient ISNAR reviews.

This methodological framework is the result of a synthesis of ISNAR's experience in and approaches to system reviews. After seven years of experience in 40 NARS in the developing world, the level and areas of focus of ISNAR reviews are now definable based on practical comparative experience. ISNAR now has products in this area that serve as a guide and allow us to evaluate the factors that have contributed to more effective reviews and country collaboration. This framework also builds upon the ISNAR strategy paper "Working to Strengthen National Agricultural Research Systems: ISNAR and Its Strategy, 1987." The strategy elucidates the goals and range of ISNAR's collaboration with NARS; it also identifies the 12 critical functions and components that NARS must have in place in order to be effective. With the benefit of the ISNAR strategy and a synthesis of our experience, it is now possible to develop procedures that focus on those areas and issues where NARS can be strengthened. We know the pitfalls to be avoided and the areas where reviews need to be strengthened and the process made more efficient.

A methodological framework for system reviews does not restrict the diagnosis to a narrow range of considerations, nor does it restrict the actual techniques used to gather information. Furthermore, use of a methodology will not limit the range of issues and problems that may be identified in particular cases. Those issues are dependent upon the situations within each country, which are in fact unique. What it does restrict is the range of unnecessary and extraneous information collected, and it focuses the review on those issues that are relevant to ISNAR's mandate and the management problems of the NARS.

The three major goals of an ISNAR methodology for system reviews are:

1. to identify and focus on the issues and processes that occur within the organization and management of NARS and those areas that can be strengthened;
2. to insure that the conclusions and recommendations of the review report are supported by the information and analysis generated in the review process;
3. to develop a consistent set of logical procedures that will contribute to a standard of comparison for evaluating the effectiveness and efficiency of research systems.

This paper summarizes ISNAR's approach to reviews. It is intended as a guide for ISNAR staff and can be shared with our national and regional collaborators in the review process.

Table 1. ISNAR/Country Involvement In NARS Review Missions

1981	Costa Rica Kenya Indonesia	1985	CARDI* Gambia Panama Tunisia
1982	Burkina Faso Fiji Guyana Ivory Coast Malawi Papua New Guinea Pakistan Rwanda Solomon Islands	1986	Ethiopia Niger Zimbabwe
1983	Dominican Republic Madagascar Somalia Sri Lanka Sudan Western Samoa	1987	Cameroon Sudan Costa Rica
1984	Kenya Morocco Zaire	1988	Ecuador Burundi Laos Guinea Conakry Mali Syria NIFOR**

*Regional System Review
**Commodity Institute Review

The Importance of ISNAR System Reviews and the Rationale for a Methodological Framework

The review of a national agricultural research system is a necessary feature of ISNAR's involvement with a developing country. This aspect of ISNAR's work remains as central to the organization now as it was in the first few years of ISNAR's activity.

System reviews are necessary in order to identify problems that underlie constraints and those that are merely symptomatic. ISNAR system reviews also identify the priority issues for change, outline a range of possible options, and suggest an appropriate plan of action. In some cases, ISNAR has been able to assist NARS with aspects of their organizational processes without requiring a full system review. This occurs when ISNAR is satisfied that a system is already adequately defined. We must not assume, however, that because NARS may experience problems with particular aspects of their management there is no longer a need for a full review; that ISNAR can simply deliver the specific tool to address that management problem without looking at the system in greater depth.

Experience of Reviews and Refinements in the Approach

The "Guidelines for ISNAR Reviews and Evaluations" from 1984 served a useful purpose and has elements that are still appropriate. However, as a checklist approach it has proved difficult to use. It prescribed a set of review procedures that were exhaustive and difficult to operationalize. While warnings were given frequently in the text that not all of the checklist questions should be pursued, little guidance was offered on how to decide what should be left in or out or how the information should be used to answer specific questions. A great deal of experience and judgment had to be brought to the Guidelines

by the reviewer. This necessarily made the quality and focus of the reviews largely dependent upon the experience and individual orientation of members of the review team. No framework of what constituted a desirable research system was given as a basis for the review of management mechanisms in place. The depth of coverage, scope of the review, and definition of what constitutes a national agricultural research system was highly variable.

Some early reviews attempted to collect information and advise on a very wide range of research topics. However, experience has shown that this is not an efficient use of time and ISNAR resources, and it produces reports with less potential impact for initiating the process of change within NARS. An explicit methodological approach helps in establishing guidelines for data collection in multi-institutional collaborative teams: diagnostic reviews should focus mainly on management and organizational aspects and not on program content or physical facilities, data collection should be restricted to the minimum necessary to give a sound basis for essential recommendations, and close collaboration with national staff participating in the review is very desirable.

Consolidating and refining our methodology enables us to consider ways to make ISNAR's review process more efficient. A reordering of what is emphasized in the chronology and the phases of the review process may allow us to identify the issues sooner. By examining the size and composition of the review teams, we can make them more effective and use our resources more efficiently.

Justification for a Methodological Approach to Reviews

Given the range of clients and types of requests for ISNAR's services, each collaboration within a given country and agricultural research system becomes a special case – a particular problem in a particular country that ISNAR is called in to help solve. Is it possible to develop a set of uniform procedures or methods that can adequately address what is actually a series of unique requests and conditions? Should ISNAR attempt to do this? This paper argues that we have sufficient experience to move in that direction.

There are three considerations that call for a more systematic approach:

1. Regardless of the specificity of the formal request, NARS may not always identify their needs. The request from a NARS for assistance in a specific area of its activities is *symptomatic* but does not identify the critical issues that may be the cause of the problem. Research managers may perceive a problem in the management of research, the source of which may lie in the area of national research policy, internal and external linkages, or the very structure and organization of the system itself. While fully aware of "the symptoms," managers may benefit from external advice and support in order to address the fundamental issues of policy, organization, and management that produce the problems.
2. A second vital aspect of the review process is that it considers national agricultural research institutions and activities within a systems framework. By *system* we mean (a) a set of entities with (b) a set of specified relations that (c) make it possible to deduce some relations from others; or to deduce the behavior or history of the system from the relations of its components.
3. A third aspect of the review process is that it combines the focus on the 12 critical functions and components (elucidated in the ISNAR strategy) with a systems approach that considers the relations between the components of the system and the system's goals.

This methodological approach is not an exhaustive look at the system, but an *overall* view that considers questions of linkages, as well as the range and scope of the NARS in its environment. ISNAR reviews look at the *processes* within the NARS to analyze the critical *issues* that need to be addressed. A successful system review is the initial phase in the process of change, a process of improving the effectiveness and efficiency of national agricultural research.

Based on the observations stated above and in consideration of the progress ISNAR has made in understanding national agricultural research systems, we need to sum up and sharpen our focus to the critical issues that NARS face in planning for change and improved performance.

Situating System Reviews within the ISNAR Strategy

ISNAR's strategy defines the procedures for ISNAR-country collaboration, as well as those critical functions within NARS that need to be strengthened to improve the effectiveness and efficiency of agricultural research. System reviews must take account of the phases of collaboration with NARS in order to contribute to the realization of subsequent steps in the process. While the ISNAR team assumes much of the initiative and leadership during system reviews, we are increasingly fostering a greater reliance on national and regional partners in the processes of information gathering and analysis.

The final products of ISNAR system reviews are judged by their objectivity, depth, and breadth of coverage of the critical issues and options for change within a NARS. The need for objectivity and adequate coverage of the issues may imply that ISNAR should continue where possible to finance its reviews from core budgeting. Where reviews are funded by a specific donor to the country, ISNAR will continue to affirm its independent role on behalf of the national system to provide a range of options for strengthening agricultural research.

D-P-I Phases

ISNAR has adopted a three-step diagnosis, planning, and implementation (D-P-I) strategy for collaboration with countries to strengthen their research systems:

- a *diagnostic* review of the whole system to determine key constraints and identify potential solutions to strengthen the system or aid in system building;
- the development of a *plan* to introduce measures to overcome the constraints;
- the *implementation* of the plan, in which ISNAR might collaborate on specific aspects to improve components of the management system.

Any diagnostic review must take this D-P-I sequence into careful consideration. System reviews should set the stage for the subsequent steps in this process. They should be oriented to the next steps of planning and implementation *after* the government has accepted the diagnostic analysis and recommendations for improving the effectiveness and efficiency of the NARS.

Outputs of the Diagnostic Review as a Basis for the Planning Stage

The fundamental goal of a system review is to serve as a catalyst for change and system building within the NARS. The successful outcome of a review is a planned process of change that is aimed at improving the productivity and relevance of agricultural research.

The reviews should generate several outputs and products that contribute to this successful outcome.

1. First, the review will necessarily cover and gather much of the information that is needed to define the system and identify the interdependent components, as well as the external linkages. In many cases of system building, a major product of the review is the introduction of the NARS concept into the organization of agricultural research.
2. Second, the review will analyze the strengths and weaknesses within the research system to identify the priority areas for change. This intermediate product of the review may result in a short-term action plan, which identifies the essential requisites or preconditions for further system building or planned reorganization of the NARS. This does not entail major restructuring or new allocation of resources. At this stage, the review should produce recommended actions well within the existing scope and organization of the NARS.
3. Third, a system review necessarily covers and gathers much of the information needed to develop a strategic plan within NARS. This entails the specification of a range of realistic options and a preferred scenario for national agricultural research. These strategic options are presented with information on the relative level of resources and organizational frameworks needed to support them.

The review itself will not produce the strategic plan; however, it will specify the preconditions and entailments required to enter into the strategic planning process. The review will also provide a range of options for consideration in the strategic plan. The changes implied in the strategic plan must be considered and implemented at the policy-making level within the country. There is, therefore, an essential stage between diagnosis and planning that is not an ISNAR stage but that is a national government stage during which decisions about agricultural research policy and development are made.

The manner in which the review process is organized and the degree of focus in the identification of issues and recommendations may, however, contribute a great deal to advancing the process of change within the NARS. A good collaboration between ISNAR and its partners in NARS and regional organizations may set the stage for a more rapid and thorough consideration of the products of the review. The review may also provide NARS leaders with specific components and arguments along with a strategy for change that they can put in front of policymakers. ISNAR's review report should be presented in such a way as to convince government policymakers that these steps should be taken.

The essential output of a review in relation to the planning stage is in providing a basis for determining realistic goals for the NARS and the level of resources, organization, and planned capacity that these entail. Determining the strategy and scope allows the NARS to move to the planning stage where the broad research priorities are fixed and the corresponding resource needs are estimated with some precision. The planning process is narrower in scope and is likely to require quite different, more specialized, personnel in the team. The actual implementation phase follows an agreed upon and adequately funded plan.

***ISNAR System Reviews and the Published Document:
The Intended Users of This Product***

Another major product of NARS reviews is a final report published by ISNAR. Thirty-nine national and regional system reviews have been produced thus far. The review report is published at the conclusion of the review process, after the country has considered and

accepted the analyses and recommendations. While the major output of a NARS review is to catalyze and guide the process of change within the national system, the report itself is an important product with a variety of interested users.

Published NARS reviews provide a country with a concise and comprehensive account of the state of its agricultural research. This is a tool for NARS leaders in their interactions with policymakers. It helps establish the role of research clearly within national agricultural and economic development policy.

ISNAR review reports are also useful for donors to identify those areas in need of technical and financial assistance. Furthermore, a published review signals the willingness of national policymakers to take decisions to strengthen agricultural research. The existence of a review is an indication that resources targeted for research will be allocated on the basis of realistic assessments of needs, goals, and planned capacity.

The published ISNAR review document serves as a record of our work to the community that created and supports ISNAR. Published reviews also serve to extend the NARS concept in developing countries. Collectively, the reviews provide the most detailed and comprehensive published information on the existing state of agricultural research in much of the developing world. This methodological approach provides a framework for developing and employing information-gathering instruments that yield more standardized and comparable information. Given the limited time available during review missions, such tools may improve the quality and augment the quantity of information collected, without increasing the scope of the review or the level of resources allocated to it. By enhancing the value of the document as a comparative base of information on NARS, they are more useful to the NARS, to donors, and to the emerging field of agricultural research management.

Methodological Framework for NARS Reviews

The methodology we are proposing is not a checklist but an analytic framework for reviews of NARS with the goal of producing recommendations consistent with the scope and capacity of the research system. A simple checklist of functions and models of structure can be exhaustive and can still fail to identify underlying causes of the dysfunction within the system. Dysfunction may lie not within the functions (or 12 critical factors) but rather in the relations between them. Our goal is more than a comprehensive and tidy review document. We seek to induce change within NARS to make them more effective by providing NARS managers with information on the critical issues and problems they confront.

To move to a more process-oriented and dynamic analysis of agricultural research systems, ISNAR reviews should apply a systems approach to the 12 critical factors for effective and efficient NARS. This will enable us to focus more closely on the relations and interdependencies that lie at the heart of organizing and managing NARS. The essential organizational and management processes would be evaluated in terms of their *scope*, *coherence*, and *complementarity*. This revised methodology includes:

- a framework for the study of processes that applies a systems approach to the 12 critical factors in NARS;
- a framework for functional analysis among multiple NARS components;
- an outline of the sequences and task allocations in NARS reviews.

A Framework for Analyzing NARS Processes and Functions

SCOPE – COHERENCE – COMPLEMENTARITY + the 12 critical factors for an effective NARS

Policy

1. Interactions between national development policy and national agricultural research
2. Formulation of research policy: priority-setting, resource allocation, long-term planning

Structure and Organization

3. Structure and organization of research systems
4. NARS linkages with policymakers
5. NARS linkages with clients and farmers
6. NARS linkages to sources of world knowledge and technology

Management

7. Program formulation and program budgeting
8. Monitoring and evaluation
9. Information management
10. Human resource development/management
11. Development and management of physical resources
12. Management of financial resources

Operationalizing the Systems Approach:

In applying a systems approach to agricultural research institutions, it is important to remember that a system is an analytical concept, not a concrete entity. The systems concept is applied in order to better understand how entities operate and how they relate to one another and their environment. Leading scientific theories of systems analysis have emphasized this point:

"A system, roughly speaking, is a bundle of relations."¹ "A system is a set of parts coordinated to accomplish a set of goals."²

In operationalizing the systems approach, we have identified two essential steps.

1. Rapoport, Anatol. 1986. General Systems Theory. In *Encyclopedia of the Social Sciences*.
2. Churchman, E. W. 1979. *The Systems Approach*. New York: Dell.

The first step in applying such a systems analysis is:

- to determine what is to be included within the system;
- to determine what is not in the system but still forms part of the environment of the system;
- to determine what is extraneous to the system altogether and falls outside the analysis.

The second step in systems analysis is to evaluate the behavior of the system in relation to its goals. This entails consideration of the structure and function of the system.

Defining the agricultural research system and the entities that are to be included in it is done according to:

- the existence and intensity of the *specified relations* between components that generate agricultural technology and information, whereby it is possible to deduce other relations, such as
- the behavior and history of the system.

There are many entities engaged in agricultural research that are linked by specified relations. At the core lie public institutes created for the primary purpose of agricultural research. These may be linked to universities through specified relationships or to private research foundations or even to private-sector research companies and development projects. Whether these are part of the system or constitute part of the environment to which a system reacts depends on whether the relations are specified, structured, and not ad hoc. These specified interrelations among the components of an agricultural research system constitute the structure of the system.

The structure of the system will of course vary according to the level of development, resources, and history of agricultural research in a particular country. In more developed countries the private sector has entered into specific, formal relations with public research institutes, thus making them part of the system. Commonly, faculties of agriculture are structurally linked to agricultural research institutes, thus making them part of the NARS. The criterion for determining whether or not they are part of the NARS is the type of relationship that exists between the entities. Finally, there are entities that are not engaged in research per se but that are structurally part of the system in so far as they contribute to policy formulation and resource allocation within it. These entities are councils, boards, and other bodies that act as formal linkage mechanisms to ensure the flow of necessary information and resources to the NARS.

There are many entities that are not part of the NARS but are important to consider in the analysis as part of the environment. These entities influence the behavior and performance of the NARS. By *behavior* we mean short-term reversible changes in the system based on managerial decisions or in response to the environment. Where private-sector research institutions are not structurally part of the NARS, they are part of the environment to which the NARS must respond in order to determine its areas of comparative advantage and allocate its resources efficiently. The review can evaluate whether or not a formal linkage mechanism is an appropriate response for the NARS. The same applies to linkages with policy environment, donors, development projects, and clients.

Evaluating the Processes and Performance of a System

Having defined the components and environment of a national agricultural research system, the review considers how the system achieves its goals. This process takes into account whether or not the structure is adequate for the task to be performed. Are the components of the system coordinated in a way that is appropriate to the identification of goals and the marshalling of necessary resources? Are the resources and activities (functions) of the system directed towards the system's goals? These elements are identified in the 12 critical factors in the ISNAR strategy. The key concepts in evaluating the performance of the system along the lines of these critical factors are the *scope*, *coherence*, and *complementarity* of the NARS.

The Scope of the NARS in Relation to Its Goals

The first task is to identify the scope of the research system and to determine whether it is commensurate with the available resources and demand for research. The scope is where the goals of the system are evaluated in relation to:

- the demand for research;
- the relevance of the research goals;
- realistic capacity, actual or planned;
- available and projected level of resources.

Developing countries are in need of the benefits that agricultural research can provide. In many cases, however, they lack the resources and capacity to conduct effective research. Determining the appropriate scope of a research system is an essential step in developing an effective and efficient NARS. The processes involved in determining scope are primarily ones of *linkages*.

- The first linkage is between the research system and the policy environment where decisions about the overall goals and priorities and level of resources allocated to research are made.
- The second linkage is between the research system and its clients, the users of research (the demand side).
- The third linkage is the response to research activities that take place outside the system so that the NARS does not allocate resources in areas where it has no comparative advantage or where other institutions can respond reliably to the demand.

Evaluating the scope of a NARS will require a focus on the relations between several of our 12 critical factors. Where the scope of the NARS is too large or too small, there is often a problem in the agricultural research policy, which may be the result of poor linkages between the NARS and policymakers and between the NARS and its clients. These in turn may entail problems in the structure and organization of the system which are inappropriate to the tasks and goals. Unwieldy and inappropriate structures generate problems in management and in the allocation and use of resources as well (critical factors 6-12). A NARS may have the appropriate scope but lack the resources to carry out its tasks. This means that problems in policy linkages and lack of formal mechanisms have prevented the system from receiving the resources required to achieve its goals. The issue of scope applies equally to system, institute, and program reviews.

The Coherence of the NARS: Its Goals and Values

The effectiveness of an agricultural research system is largely an issue of *coherence*, by which we mean the degree to which the goals of the system are understood and implemented at the various levels and in the components of the NARS. Increasingly, these goals are being considered in terms of a coherent set of values that motivate people within a system to understand and work towards the goals of the organization. Even a small system with scant resources can have a very positive impact on a country's agricultural sector, if it is able to function in a coherent manner around a well-defined set of goals.

Lack of coherence can result in a situation where each level and component of an agricultural research system is a bottleneck, impeding the flow of information and resources needed to carry out the system's goals. For example, we may encounter situations where staff at various points in the system appear to be carrying out the functions implied in our 12 critical factors. However, because they are operating with diverse sets of goals and values, the research system has little impact on agriculture and has difficulty in attaining its goals. This situation illustrates the need to consider the 12 critical factors in a dynamic and interactive manner in order to identify the processes and issues that link the system and enable it to function.

We evaluate coherence by examining how the structure/organization and management procedures of the NARS are concordant with and further the policies and goals of the system. The way that research leaders and organizations impart goals and values to staff is critical. In measuring the role of coherent values in motivating effective agricultural research systems, the following points should be considered:

1. how the research output is defined and measured;
2. how staff at various levels interpret and value their functions and output;
3. how monitoring and evaluation functions are carried out in the NARS.

While recognizing that definitions of research output vary widely and that criteria for measuring such output are as yet poorly developed, we can begin to look at the consistency in the application of these criteria. Consistent criteria for measuring and evaluating research activity and output are what promote a coherent set of values that motivate staff around a set of goals. Since the actual "substance" that binds the organization into an effective research system are the human resources, the question of values and goals are central to an organization's coherence.

Goals and values within organizations and systems. Several factors inherent to the management and organization of research systems can impede the development of a coherent set of goals and values.

Vertical dimension. Goals and values can become less coherent because of the hierarchical organization of research, which is in turn caused by the level of training and responsibility. What senior scientists regard as their principal goals may be quite different from those of the research managers concerned with national policy. Both scientists and managers may perceive a different set of goals and share different values from the technicians, extension agents, farmers, and other clients. A coherent set of values must be maintained within the system so that the various levels of activity and responsibility within the NARS work towards common and mutually reinforcing goals.

Horizontal dimension. A national agricultural research system is subdivided into various components that are institutionally or spatially separate. These may be commodity research institutes; institutes focusing on specific environmental, systemic, or technological problems; university research institutes; etc. Furthermore, within a single institution there are dispersed components, regional stations, etc.

While these components are often on an equal footing structurally and administratively, they may nonetheless develop different values and interpretations of the NARS goals because of their horizontal dispersal and functional specialization. As systems develop and begin to coordinate a larger number of dispersed components, it becomes increasingly important for research managers to pay attention to the coherence of values and goals. The effective management of the organizational culture and values can prevent the development of managerial problems between the "core" and "periphery" of a NARS.

Allocating increased resources to a system that lacks coherence will not necessarily improve its capacity to implement the goals of agricultural research. Without coherence, increasing resources may actually accelerate the disaggregation of the system's components, its programs and institutes. One problem facing NARS is how to successfully integrate multiple and divergent external funding sources. Different donors may have multiple policies implicit in their allocation of funds to a developing NARS. Without a set of coherent policies, goals, and values, donor funds are often allocated to specific programs, frequently weakening the ability of the NARS to manage and allocate its own resources. The very allocation of resources by donors to specific programs and institutes can result in a de facto reformulation of national research policy, which can undermine the importance of the policy and priority-setting process within a NARS.

Complementarity: The Operational Processes

Once a research system has formulated a policy and defined its scope, created an organizational structure, and adopted institutional goals and a set of motivational values, the system must be put into operation. This means articulating the various levels and components of the system in accordance with a functional division of labor and a set of internal and external linkage mechanisms.

The six critical factors of management should be analyzed in terms of their *interrelations* in order to assess the *complementarity of the process*. The review should discern the degree of complementarity between the financial, human, and physical resources and the research program. The management of information on the human, physical, and financial resources should be sufficient to permit effective program formulation and budgeting, as well as periodic monitoring and evaluation. The costs of maintaining these management systems should be in accordance with the scope and size of the NARS.

The analysis of complementarity also focuses on the relations between the planning and priority-setting process and the programs and linkages of the system. For example, if national development policy has determined that technology for small farmers and food production are the research priorities, there must be strong linkages with extension and farmers. Such a policy may also imply an organizational structure that is more regional and decentralized.

Allocation of resources should reflect the relative importance of the various commodities within national agricultural development policy. Different types of activities require different minimum levels of investment and support. Investment below this level is often wasted. Most types of research require support and input from other sectors within the research system. Complementarity of efforts and complementarity in the flow of resources

between sectors of the research system is vital to the functioning of most individual programs.

Reviews need to consider the functional complementarity between the components of the NARS to identify areas of:

- duplication of effort
- dispersed effort
- disjointed or poorly coordinated effort.

Framework for Functional Analysis of NARS Components and Responsibilities

Another important conceptual framework for review of NARS is institutional analysis using responsibility charts (see figure 1) to map the mandate, functions, and responsibilities of components within the system. This methodological tool is used in ATMS analysis and is useful for the first stage of reviews, provided the focus is on a few key organizations and components within the system that are concerned with technology generation per se.

The responsibility chart identifies the key components and participants, their mandates and locations within the system, and their level of participation in each of the 12 critical functions ISNAR has identified. The linkage and operational mechanisms in place should be understood so that the required functions can be performed.

NARS Reviews and the Areas of Policy, Organization, and Management

ISNAR has identified the areas of policy, organization, and management in which critical functions must be carried out for a NARS to be effective and efficient. The relative emphasis that system reviews give to the three areas varies according to the level of development and problems confronting the NARS. *Policy* is where the demand and supply sides of the technology-generating system are regulated and managed (with varying degrees of efficacy). The *scope* of the NARS is determined at this level. A major problem for many system reviews involves instances where the scope of the NARS is not appropriate to the needs and capacity of the country.

Organization is where the degree of complementarity among the components and institutions that comprise the NARS is often evaluated. It may contain significant disjunctures within and between its components that may either limit the productivity of the system or lead to duplication of effort and inefficiency. However, these organizational concerns can only be evaluated once the policies and scope of the system have been identified.

If there is trouble at the levels of policy and organization, *management* is where problems within the various management functions are likely to occur. Should the policy and organizational factors be judged sound and appropriate to the NARS and the country, then the management weakness can be remedied through training and the transfer of specific management tools and components. ISNAR review teams need to recognize that in the eagerness to resolve their problems and increase their productivity, NARS frequently request assistance in the transfer of specific management components. To focus attention at this level early in the review process may lead to investment of resources by NARS in areas that do not contribute to developing the capacity to plan and conduct research in response to national development policies and the needs of the farm sector.

Reviews begin by defining the system and its scope, coherence, and complementarity, then the internal management processes themselves can be focused more closely on. There are two major themes in research management:

1. **Process.** This ensures that the research process is efficient in determining the program, implementing it, and communicating the results to users of the information. The mechanisms employed generally require a *collegiate* style of management.
2. **Capacity.** This involves developing and maintaining the capacity to carry out research – personnel, facilities, and finances. The management mechanisms involved here may well require a *hierarchical* style of management.

Throughout the research system, management must ensure that there are the best linkages and flow of information upon which to base decisions, consistent with the available resources. Most developing countries must concentrate on the minimum resources required to implement adequate management mechanisms. To this end, NARS managers and policy makers need the concepts and styles of the necessary mechanisms, general parameters and criteria for the resources needed, and the management tools and procedures necessary to get things done. Research managers need to understand their system in relation to a paradigm of NARS in specific contexts. Providing this comparative basis is an essential function of NARS reviews.

Formulation and Presentation of the Recommendations

The country expects a review to yield recommendations that are consistent with their needs and capacity for change. These can serve to guide the formulation of an action plan to begin the process of change. For these reasons, the recommendations must be carefully selected and formulated in terms of priority and in line with existing capacity for change within the NARS. The following considerations are important in formulating the recommendations:

First, developing-country NARS are constrained by many structural factors as well as resource limitations. In many cases, the ability of these systems to change is incremental and limited to only few major issues on which they can take action in any given planning cycle. Even where major structural changes are recommended, the decisions and actions that NARS must undertake to establish the preconditions for further system building need to be clearly defined. These few recommendations should form the basis of an action plan to follow the review.

A second consideration for formulating and presenting the recommendations is that they be placed in a framework of logical priority in terms of preconditions, requisites, and entailments. For example, in the event that a review report produces an extended list of recommendations, these can be grouped into just a few categories that include the necessary preconditions – those that are required in order to plan or implement other structural changes. These changes may be to enhance the NARS planning capacity, improve the linkages with policy makers and clients, improve priority-setting mechanisms, etc. Establishing these conditions will enable NARS leaders and managers to take further steps to improve the productivity and efficiency of the system.

A third consideration in formulating recommendations is the institutional capacity for change and the time and costs involved in its implementation. Recommendations are therefore based on an understanding of the feasibility, timing, and resource implications involved in their implementation (even though they are not necessarily specified). Returning to our earlier discussion of the focus of system reviews within the three areas of poli-

cy, organization, and management, there is an operational distinction between the level of focus at the stage of the systems analysis and at the recommendation stage for the subsequent action plan. While the first stage in the review implies a focus at the levels of policy and organization in order to understand the system and the sources of the constraints, the recommendation stage may require a greater focus at the level of management. This is due to the costs of implementing changes in the areas of policy and organization that require major restructuring of research institutions and their articulation with public-sector bureaucracies.

Our methodological approach is to consider policy and organization as critical areas for understanding the system and its constraints and to look closely towards the area of management, planning, and priority-setting processes when making recommendations. While the areas of policy, organization and structure may be sources of problems, we are suggesting that given the time and costs involved in changing and restructuring those areas (particularly in public-sector research institutions), it may be prudent to accept them as givens and propose improved linkages and management mechanisms that will enhance productivity of research within the existing structure and policy environment. This contingency approach can be used even where major structural changes are proposed.

Chapter 2. Organizing ISNAR System Reviews: Phases and Allocation of Time and Resources

Reviews normally involve the participation of ISNAR senior staff, consultants, and NARS managers and staff. We can examine the overall investment of time in relation to the three types of staff involved and in light of this more focused methodology.

Table 2 provides a breakdown of staff and consultant time allocation throughout the review process. This is useful as a baseline for considering changes in the distribution of time and resources in the review process. Figure 2 shows the number of weeks spent on reviews. Since 1985, we can discern a slight trend towards less time spent on reviews by ISNAR staff. This need not affect the quality and effectiveness of the reviews, provided a more efficient use of resources is implemented using a focused methodology.

Table 2. Average Staff and Consultant Time Used in Review Missions
(up to 20 June 1985), in Person-Weeks

	Total Staff	Consultants	Grand Total	Percent
Exploratory work	4.53	0.66	5.19	8.6
Main mission - preparation	5.96	1.68	7.64	12.7
Main mission - field work	10.01	10.23	20.24	33.7
Debriefing and writing of draft report	11.59	8.28	33.10	33.1
Presentation of report/ preparation of final version	6.05	1.10	11.90	11.9
TOTAL	38.14	21.95	60.09	100.0

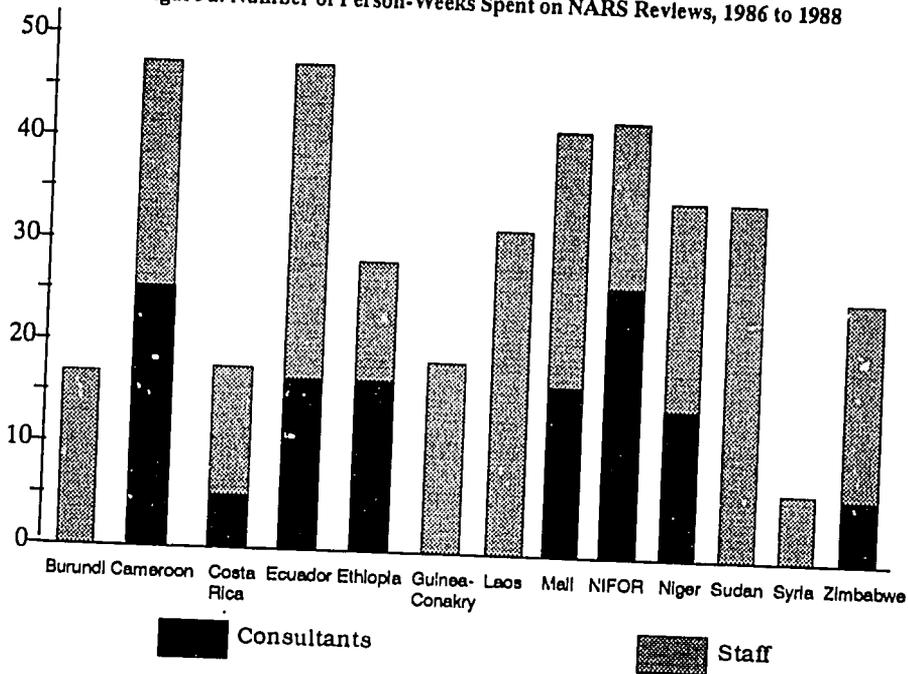
ISNAR is also developing various approaches that can be used in different situations to extend our services without dispersing our limited resources. These approaches are being tested in small-country NARS and in countries where the system has been sufficiently studied so that much of the required information is already available. Because these cases are examples of system reviews that were conducted with a much smaller investment of staff and consultant time and resources, they are atypical.

Overall, there appears to be little room for further reduction of ISNAR staff time. However, a more focused review oriented around specific management issues may permit a reduction in the number of outside consultants and obviate the need for specific specialists on crop programs and commodities. The proposed approach should enable ISNAR reviews to operate effectively with teams of three to four people in the main mission. Teams of over five are unnecessary except in cases where the NARS is so large that the scope of the review is of an entirely different nature than what ISNAR has previously done.

Furthermore, while smaller ISNAR teams with fewer consultants may be able to conduct effective NARS reviews using an issues-oriented methodology, there is little scope for reducing ISNAR staff time in the preparation of the reviews. This applies particularly to the exploratory/preliminary mission or in-country stages. The potential products and importance of the preliminary mission are currently underestimated and underexploited.

Reinforcing the current trend will require more effective use by ISNAR staff of the available background documentation on the country and its NARS through closer collaboration with ISNAR's library and documentation specialists. It will require maximizing the information and analysis of the scope of the NARS produced by the preliminary mission. It will also require the use of the analytical frameworks and information-gathering instruments that are currently being developed by ISNAR's working groups and research program. Finally, it will require the organization and involvement of national research managers and staff in the information gathering and review. These conditions can be met under ISNAR's current program. The appended outline provides a schematic view of the procedures and steps in the organization and conduct of system reviews.

Figure 2. Number of Person-Weeks Spent on NARS Reviews, 1986 to 1988



How ISNAR's Components Can Contribute to More Effective and Focused Reviews

The various programs, working groups, and support components of ISNAR can contribute to improving the review process. ISNAR's research program can produce the data-gathering instruments and identify the organizational paradigms, management mechanisms, and tools appropriate for different contexts. ISNAR's library can identify and gather the necessary background documentation prior to each phase of the review and enable the review team to focus its data-gathering activities in the country on those areas that have not yet been covered.

ISNAR working groups are making immediate contributions in three priority areas by producing information-gathering instruments on:

1. human resources in NARS;
2. financial resource management in NARS;
3. an analytic framework for evaluating the functional implications of the various types of organizational structure.

A human resource questionnaire that yields valid comparable data that can be easily adapted for use in a range of NARS is being developed. Research assistants and in-house information systems specialists will be able to organize much of the data collection and analysis.

The management of financial resources in NARS is a critical area for NARS reviews, and is one where ISNAR is working to develop more standard categories for gathering and analyzing information. The research program and the working group on financial resources can be engaged to produce the framework for collection and analysis of financial resource management in NARS. Research assistants or consultants might be called in to work on this task.

The area of organizational structure is one in which ISNAR is currently conducting research that is likely to yield important products for use in NARS reviews. The dimensions of NARS in developing countries can vary greatly along with the type and range of institutions that are included within the system. Furthermore, organizational models will vary widely in form and operation depending upon the political-bureaucratic context in which they are embedded. The products of research by the working group on organization and structure will be models that work in various contexts and further our understanding of how the functions common to all NARS are carried out under differing organizational structures. This can be used in the structural-functional analyses that lie at the core of every NARS review. The typology of organizational models will enable ISNAR reviewers to consider the management mechanisms and tools that work well in the given structures.

Overall, the use of more consistent information-gathering instruments as well as common definitions and categories in the course of NARS reviews will be a major step in maximizing the comparative analytical value of the reviews.

Use of existing documentation. Another important contribution by ISNAR's research program to the NARS review process can be made by the library and documentation services. The library can prepare the necessary background information for ISNAR's review team well in advance of the mission and thus avoid instances where time is spent gathering these secondary sources of information in the country. This requires planning on the

part of the review team leader to prepare adequately for the mission and to advise the library staff well in advance of the mission. Given the erratic use of documentation in advance of missions, more formal procedures may be useful. This may entail greater allocation of resources to our library and documentation staff.

One consideration is for ISNAR to allocate research assistants to work with review teams in the collection, organization, and analysis of information. This would be possible under the proposed methodology that would encourage more standardized and comparable information gathering. It may prove less costly than the use of consultants in the country to do similar things. The research assistants can continue to work between missions with working groups to make the information available to a range of projects for which ISNAR reviews present a rich fund knowledge about NARS.

Preparing and presenting the report. A final phase of the review process is the preparation of the report itself. The in-country review process serves as a catalyst for change in a NARS. It enables managers, researchers, and policy makers to look at the research system per se and to consider the need and potential for change and improvement. ISNAR's presence serves to give the support and encouragement needed to consider change, while it emphasizes the importance of the agricultural research system for national development. Producing a focused review report in a timely fashion will increase the likelihood that the recommendations come at a time when both researchers, managers, and policy makers are ready for change.

Another aspect of the final report from ISNAR's perspective is to organize a debriefing of ISNAR staff once the review is finished so that the lessons and experiences derived from the review can feed into the full range of ISNAR's work and contribute to our fund of global knowledge and identification of major issues within NARS. This feedback process can be strengthened within ISNAR to maximize the products of the reviews.

In conclusion, the overall system review of NARS remains a key activity within ISNAR. It can, if fully exploited, contribute to the entire range of ISNAR's activities and allow the production of better tools for improving the efficiency and effectiveness of NARS. The need for analytical systemwide understanding of the NARS remains a critical first step in the process of change that NARS must undergo to better serve their goal of contributing to agricultural and national development. It is our intention to facilitate that process by providing a more focused methodological framework for ISNAR's work in system reviews, and to consolidate the considerable experience and progress that ISNAR has made in this area.

Outline of Steps and Allocation of Resources

- A. Country request, preliminary country mission, and the determination of the scope of review process**
 1. Determine nature of request
 - a. Level of government from which it originated
 - b. External factors influencing request, i.e., donors, etc.
 2. Determine capacity and willingness of country to effect reform of NARS – size of NARS, size of country and agricultural sector
 3. Assign priority to request based on above factors, potential for impact, and ISNAR's resources and comparative advantage
 4. Prepare in-house documentation based on available information
 - a. To draft country background section
 - b. To prepare materials for mission team
 - c. To set tentative agenda and issues for mission
 5. Assess scope of NARS in preliminary mission
 - a. Sketch the organization and structure of NARS, juridical status of NARS and its components
 - b. Gather additional background and NARS documentation
 - c. Assess capacity and willingness for change within NARS
 - d. Assess commitment of national government to agricultural research and change
 6. Determine the size and composition of the review mission team based on the scope of the NARS and the principal issues of research management that it must confront
 7. Maximize in-house information along with published and official documentation in preliminary report – include information and impressions gathered in the country to define the scope of the planned review
 8. Prepare background information on country situation and the state and prospects of agricultural sector at this stage, prior to the review mission itself. (Note: Preliminary mission reports are tentative and subject to revision and amplification based on subsequent involvement.)
 9. Set the terms of reference for the review mission based on the above considerations
 - a. Duration of mission
 - b. Size of team
 - c. Composition of team
 10. Prepare a format for NARS staff to gather information in advance of main mission
 - a. Convene seminar with key NARS leaders and staff to explain the review mission and the information required

Present questionnaires or other data-collecting instruments that NARS collaborators can use to participate in and assist the process

B). In-country review mission

1. Meetings with NARS and government leaders that focus on the critical factors of national agricultural research policy and strategic planning – national commitment to agricultural research
2. Meetings and visits with key persons at the various levels of the NARS to evaluate functional problems
3. Evaluation of structural/functional aspects using responsibility charts (ATMS model) to identify blockages, redundancies, and disjunctures in the NARS
4. Visits to the key components of the NARS (institutes, divisions, projects, and programs) to evaluate the complementarity and coherence of the system across its activities; use a framework of management mechanisms, norms, and tools to evaluate effectiveness and efficiency within the existing structure
5. Evaluation of the organization and structure of the NARS, based on the above three points, for efficiency and appropriateness in effecting national research policy (ATMS model is useful for depicting range of activities.)
6. Evaluation of the allocation and flow of human, financial, and physical resources (given the appropriateness of NARS organizational structure or in accordance with an alternate and more appropriate paradigm), considering whether problems are in the
 - a. unavailability of resources (Implications for NARS scope)
 - b. Inadequate allocation of available resources (Implications for NARS links to policy – organizational mechanisms)
 - c. poor management and flow of resources within the NARS (Implications for ISNAR training program)
7. Preparation of a draft report of tentative review diagnosis and critical issues to be addressed by NARS to increase the effectiveness of the research system (to serve as a working document to be distributed to NARS leaders and the appropriate policy makers prior to the review team's departure from the country)

C. Preparation of the final review document

1. Group the information according to the critical issues identified in the NARS review
2. Organize the report so that the information and the analysis contribute to and justify the recommendations; provide a basis for developing the subsequent action plan
3. Consider how the published review report will be received by the NARS leaders and national policy makers
4. Consider how the final published review document adds to and complements ISNAR's contribution to a global understanding of NARS and can serve as a basis for comparative analysis