

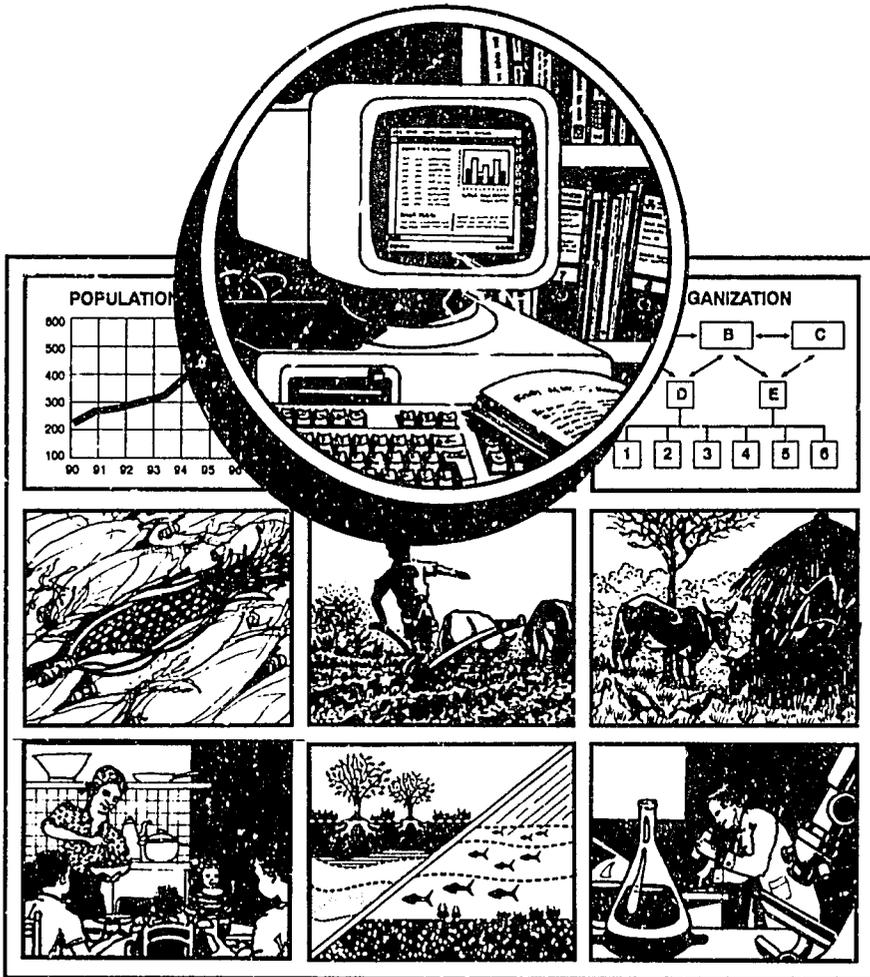


# Management of Scientific Information for Agricultural Research in Small Countries

Highlights of a Meeting

Réduit, Mauritius,

20 – 24 April 1992



The mandate of the International Service for National Agricultural Research (ISNAR) is to assist developing countries in bringing about lasting improvements in the performance of their national agricultural research systems and organizations. It does this by promoting appropriate agricultural research policies, sustainable research institutions, and improved research management. ISNAR's services to national research are ultimately intended to benefit producers and consumers in developing countries and to safeguard the natural environment for future generations.

ISNAR offers developing countries three types of service, supported by research and training:

- For a limited number of countries, ISNAR establishes long-term, comprehensive partnerships to support the development of sustainable national agricultural research systems and institutions.
- For a wider range of countries, ISNAR gives support for strengthening specific policy and management components within the research system or constituent entities.
- For all developing countries, as well as the international development community and other interested parties, ISNAR disseminates knowledge and information about national agricultural research.

ISNAR was established in 1979 by the Consultative Group on International Agricultural Research (CGIAR), on the basis of recommendations from an international task force. It began operating at its headquarters in The Hague, the Netherlands, on September 1, 1980.

ISNAR is a nonprofit autonomous institute, international in character, and apolitical in its management, staffing, and operations. It is financially supported by a number of the members of the CGIAR, an informal group of donors that includes countries, development banks, international organizations, and foundations. Of the 16 centers in the CGIAR system of international centers, ISNAR is the only one that focuses specifically on institutional development within national agricultural research systems.



*This publication is part of a project entitled "Managing Scientific Information in Agricultural Research Systems in Small Countries," jointly sponsored by the Technical Centre for Agricultural and Rural Cooperation (CTA) and ISNAR.*

*STUDY PAPER #8*

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93/4/11.13

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1992

Sponsored by  
**International Service for National Agricultural Research**  
(ISNAR)

**Technical Centre for Agricultural and Rural Cooperation**  
(CTA)

**Mauritius Sugar Industry Research Institute**  
(MSIRI)

76.212  
69.08.2

### **Citation**

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ISNAR. 1992. Management of Scientific Information for Agricultural Research in Small Countries. ISNAR Small-Countries Study Paper No. 8. The Hague: International Service for National Agricultural Research.

### **AGROVOC Descriptors**

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information services; management; research

### **CABI Descriptors**

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agricultural research; information services; management; research

ISSN 0926 -3225

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# *ISNAR Small-Country Project*

## **Introduction**

**I**n 1989, ISNAR began a global study of agricultural research systems in small, low-income developing countries with populations of fewer than five million people. Because of resource limitations and the inherent constraint of size that restrict the scale of the research effort in these countries, their national agricultural research systems (NARS) are small — often under 50 researchers. Nonetheless, these NARS have varied and complex tasks to perform in their respective countries.

The major goals of this study are to identify the strategic role of NARS in small countries and to determine how essential research tasks can be carried out in small research systems. Several

cases are to be examined in depth, and for these, the study will assess the research capacity and resources that are currently available or needed to conduct agricultural research. This is examined in light of their mandates under the agricultural development policy of their respective countries, as well as requirements for conserving the country's natural resource base.

The project is funded largely by the Italian Government with additional support from the Rockefeller Foundation, the Danish International Development Agency (DANIDA), and the CTA (Technical Centre for Agricultural and Rural Cooperation, ACP-EC Lomé Convention).

## **Objectives**

- To create and maintain a data base on 50 small countries, containing information on their agricultural research needs and national agricultural research systems.
- To devise means of measuring and classifying key factors related to agricultural research so that the NARS of small countries can be analyzed and compared. Such factors include agroecological zones, the scale of research systems (e.g., human and financial resources, sizes and types of institutes, types and quantity of local research programs), internal demand for technology, external sources of information on new technologies, and linkages to those sources.
- To identify suitable organizational models for NARS, as well as mechanisms and strategies for setting priorities and allocating resources to research.
- To evaluate national and regional research environments so as to help small countries exploit opportunities for acquiring new technologies from outside.
- To identify and assess mechanisms that enable NARS to manage their links with policymakers, local producers, and external sources of knowledge and technology.
- To identify the skills needed by small-country research leaders to manage the alternative strategies open to them.

# Project Activities

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## A Global Data Base on NARS in Small Countries

Fifty developing countries are included in a global data base on agricultural research needs and the state of the NARS. These countries have populations of less than five million (1980 census) and meet at least three of the following four criteria:

- The economically active agricultural population is 20 percent or more of the total economically active population.
- Per capita income is less than US\$2,000 (1980 US constant dollars).
- AgGDP per capita for the economically active agricultural population is less than US\$2,000.
- AgGDP is 20 percent or more of GDP.

For each country, this information will be used to assess the national demand for research as well as existing national research capacity. The data base should provide cross-country indicators of common constraints, options, and trends.

## Country Case Studies

Honduras, Jamaica, Sierra Leone, Togo, Lesotho, Mauritius, and Fiji have been selected for in-depth study. The studies cover institutional development, research organization and structure, external linkages, and information flows to the country.

## Regional Studies

Regional studies will be conducted in parts of West Africa, the Caribbean, and the South Pacific. The goal of the regional studies is to assess research capacity in regions where small countries predominate. The regional studies will also identify mechanisms and strategies by which national systems can increase their effectiveness and efficiency and gain access to the information and technology they need. The studies will consider the division of labor between NARS in a regional context as well as the role of regional research organizations and collaborative networks.

# Methods and Concepts

The ISNAR project will develop methods for analyzing research needs and capacity in small countries. These will identify key issues and employ the following concepts:

- **Scale:** the inherent research capacity of a national system: the combination of a NARS's human and financial resources, knowledge base, and infrastructure.
- **Scope:** the institutional agenda of a NARS, the set of research topics and objectives to which it is committed. Scope has two dimen-

sions: the range of research programs and the level of sophistication of the research.

- **Technology Gradients and Information Flows:** the varying intensities and levels of complexity in technology generation among national systems and the network of information exchange. An analysis of structure and levels of technology generation and transfer in a region is crucial for guiding the flow of information to smaller research systems. The study of gradients and flows also examines the capacity NARS must have in

place to have access to the technology and information they need.

- **Linkages:** linkages to institutions and systems outside the NARS itself. The study will explore two key sets of linkages that are

essential for the national agricultural research system. The first includes linkages to policymakers and to farmer knowledge systems in the country. The second includes linkages to external sources of knowledge, technology, and resources.

## Managing Scientific Information

**I**n collaboration with the CTA (Technical Centre for Agricultural and Rural Cooperation, ACP-EC Lomé Convention) and agricultural research information specialists from developing countries, a study is underway to explore the management of scientific information in small research systems with limited resources.

Access to scientific information that is relevant to the development of objectives and appropriate to the conditions of developing countries is crucial for agricultural research systems. It is particularly critical in small countries because the resources to do all the research that farmers need are not always available. The scope of

research in a country can be increased through effective information management. Information can also be used to supplement or replace some kinds of research, releasing scarce resources to be used for programs that must be conducted locally.

NARS in small countries are often limited in their ability to identify and receive the information they need to conduct adaptive and resource management research. This study will assess and propose mechanisms for identifying and obtaining scientific information for research programs in small countries. It will then focus on mechanisms of managing this information.

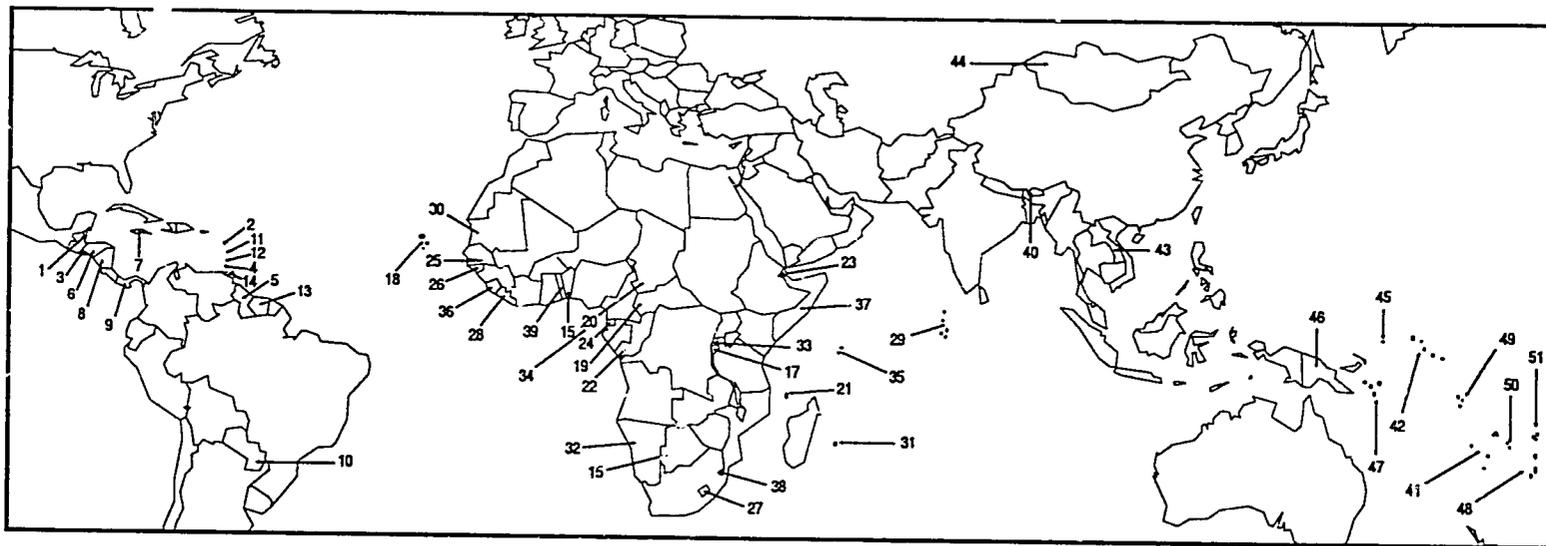
## Dissemination of Results

**Seminars/Workshops:** Workshops are the key to disseminating the results of this study. The first workshop, held in The Hague in January 1990, reviewed project methodology and began implementation of country and regional studies. When the main phase of the study is complete, a global workshop of research leaders from small developing countries will be held. At this workshop, the conclusions of the study will be validated and applied.

**Advisory Service and Training:** In collabora-

tion with national and regional agricultural research organizations, the methods developed in the study will be used for strategic planning and to produce improved management techniques for small research systems.

**Publications:** The data base, case studies, and issues papers will be published and made available to agricultural research managers, scientists, and development agencies concerned with agricultural growth and sustainability in developing countries.



### Small Countries (as Defined by this Project)

#### Latin America and Caribbean:

- 1 Belize
- 2 Dominica
- 3 El Salvador
- 4 Grenada
- 5 Guyana
- 6 Honduras
- 7 Jamaica
- 8 Nicaragua
- 9 Panama
- 10 Paraguay
- 11 St. Lucia
- 12 St. Vincent
- 13 Suriname
- 14 Trinidad and Tobago

#### Africa and the Indian Ocean:

- 15 Benin
- 16 Botswana
- 17 Burundi
- 18 Cape Verde
- 19 Central African Republic
- 20 Chad
- 21 Comoros
- 22 Congo
- 23 Djibouti
- 24 Equatorial Guinea
- 25 Gambia
- 26 Guinea-Bissau
- 27 Lesotho
- 28 Liberia
- 29 Maldives
- 30 Mauritania
- 31 Mauritius
- 32 Namibia
- 33 Rwanda
- 34 Sao Tome e Principe
- 35 Seychelles
- 36 Sierra Leone
- 37 Somalia
- 38 Swaziland
- 39 Togo

#### Asia and the Pacific:

- 40 Bhutan
- 41 Fiji
- 42 Kiribati
- 43 Laos
- 44 Mongolia
- 45 Nauru
- 46 Papua New Guinea
- 47 Solomon Islands
- 48 Tonga
- 49 Tuvalu
- 50 Vanuatu
- 51 Western Samoa

# Executive Summary

## Introduction

In 1989, ISNAR initiated a study of strategies and policies for the management of agricultural research in small countries. The small countries to be studied by the project were drawn from a sample of 51 countries with both small populations and relatively important agricultural sectors. Although the range of countries in the sample includes small islands with tiny populations (the Seychelles) through to countries with large land areas (Mauritania, Botswana), they are united by their limited resources, and therefore their limited research and information capacity.

One early implication or finding from this project was that small-country research systems require a well-managed and effective system to gain access to information and also that these information systems should be designed to suit the special characteristics and requirements of a small country. In 1990, the International Service for National Agricultural Research (ISNAR) and the Technical Centre for Agricultural and Rural Cooperation (CTA) began a study on the management of scientific information for agricultural research in small countries. Case studies in *Trinidad and Tobago*, *the Seychelles*, *Swaziland*, and *Mauritius* assessed the mechanisms and approaches used by small countries to manage their scientific information.

The case studies show that the functions and roles of information services in small national agricultural research systems (NARS) are not always the same as in larger countries. Features of small-country research systems themselves suggest that their demands for information are

more variable and subject to change; there is evidence that the mechanisms that are used to gain access to scientific information play quite different roles. And to be effective, they require concerted attention from managers and information specialists. Furthermore, new structures for organizing and enabling access to information as well as alternative roles for managers of scientific information are needed to match the small-country environment.

In April 1992, ISNAR convened a one-week meeting in Mauritius for information specialists involved in agricultural research in small countries. This meeting was designed to be an opportunity for participants to discuss the issues raised by the project and to identify strategies and approaches that could be used by research managers in small countries to strengthen their information management capacity. This meeting complemented a workshop held immediately afterward for research managers and policymakers, where management strategies and policies for agricultural research in small countries were assessed — including those related to information access and management.

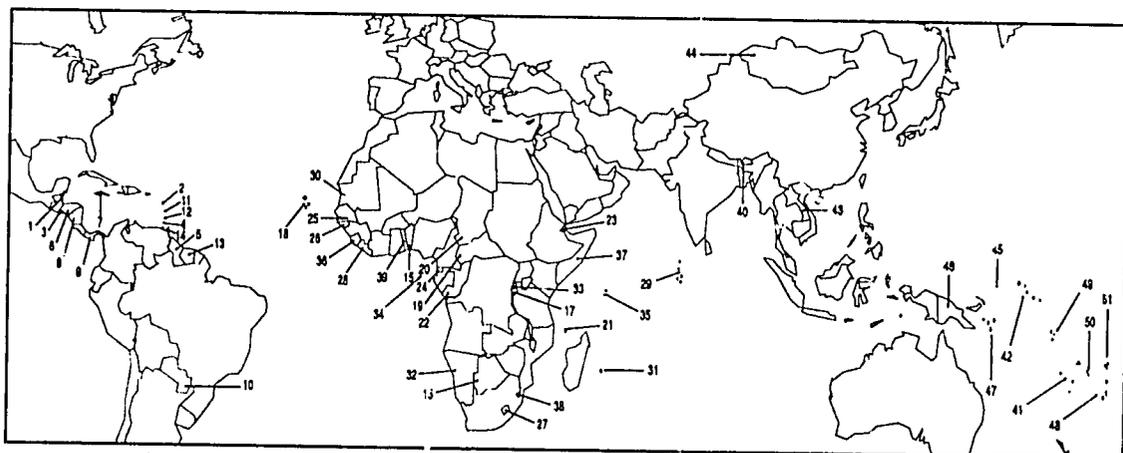
Since small countries depend on external organizations for much of their information requirements, representatives from regional, international, and other inter-governmental organizations were invited to join the 12 workshop participants from small countries. As well as being a forum for discussing the case studies and other products of the ISNAR/CTA project, the meeting was designed to promote partici-

pation and discussion by participants in the firm belief that this would lead to both interesting conclusions and an effective exchange of ideas and experiences.

One feature of the meeting was a case exercise for participants working in small groups. It ran throughout the week and provided a means by which participants could react to specific small-country problems and share their own experiences. It was also a mechanism for iden-

tifying and presenting the meeting's major conclusions and recommendations.

This report is a summary of the themes presented and discussed during the meeting, and in general, the order of their presentation is followed here. Major conclusions and lessons where research managers and information specialists can take action to strengthen the management of scientific information in their own countries are also highlighted.



### Small Countries (as Defined by this Project)

#### Latin America and Caribbean:

1. Belize
2. *Domínica*
3. El Salvador
4. Grenada
5. *Guyana*
6. Honduras
7. Jamaica
8. Nicaragua
9. Panama
10. Paraguay
11. St. Lucia
12. St. Vincent
13. Suriname
14. *Trinidad and Tobago*

#### Africa and the Indian Ocean:

15. Eritria
16. *Botswana*
17. Burundi
18. *Cape Verde*
19. Central African Republic
20. Chad
21. Comoros
22. Congo
23. Djibouti
24. Equatorial Guinea
25. Gambia
26. Guinea-Bissau
27. Lesotho
28. Liberia
29. Maldives
30. Mauritania
31. *Mauritius*
32. Namibia
33. *Rwanda*
34. Sao Tome e Principe
35. *Seychelles*
36. *Sierra Leone*
37. Somalia
38. *Swaziland*
39. Togo

#### Asia and the Pacific:

40. Bhutan
41. Fiji
42. Kiribati
43. Laos
44. Mongolia
45. Nauru
46. *Papua New Guinea*
47. *Solomon Islands*
48. Tonga
49. Tuvalu
50. Vanuatu
51. Western Samoa

Note: Highlighted countries were represented at the meeting.

## Key Conclusions

The single most important lesson from the meeting is that agricultural research systems in small countries require a minimum capacity to handle and manage information. This minimum capacity is more than just the financial resources, equipment, facilities, and skilled staff that are necessary to implement the desired activities — it is also the recognition by managers and policymakers that a system that provides effective access to information is essential for effective research.

The information system required is much more than a traditional documentation center or library — it includes research and information network arrangements; national, regional, and international linkages; information-exchange mechanisms, such as meetings, seminars, and workshops; as well as the interactions between these different parts. The collective responsibility and functions of the information system include

- identifying the information requirements of the NARS itself;
- scanning and evaluating available information resources in relation to these needs;
- coordinating national information resources and efforts;
- influencing external agencies;
- delivering the services and products that scientists and managers need.

In small countries, this information-handling capacity will undoubtedly be limited. However, scarce resources can be stretched, and one or two trained people, with the necessary support from their managers, can have a strong role and a significant impact. They can maximize the impact of their work by paying close attention to the information needs of scientists, by developing good information

management procedures, and by using innovative and creative approaches to information access, handling, and delivery.

### *Sustainable Information Systems*

Information systems, projects, and activities in small countries are difficult to maintain over the medium to long term. This is largely due to unrealistic assumptions and commitments at the design stage; however, a scarcity of local funds and trained personnel are also major constraints. Projects that depend largely on external assistance, especially, tend to have a poor record.

### *Division of Labor at the National Level*

Many small countries have several agencies involved in agricultural research and information management in agriculture. In-country coordination is weak and cooperation is informal at best. Information units in small countries must pool resources and efforts and work together to reduce the duplication of effort and fragmentation of information services that otherwise results.

### *Influencing External Agencies*

Small countries often participate in externally funded projects and receive assistance from external agencies. Although these have many potential benefits, they are frequently not well suited to the specific needs of the country. Given the importance of external agencies to small-country information systems, it is vital that relationships with them be managed in such a way that maximum benefits can be obtained for the country. This means that a small country should have a thorough knowledge of its own information needs, reliable devices to ensure that its requirements are served by the external agency, and its own professional or technical expertise.

### ***Information Personnel and Staffing***

In small countries, the most valuable resource for effective access to information is educated and trained staff. Although information staff are few in number, research managers in small countries need to recognize the growing and changing roles and responsibilities of their information specialists as well as the different functions that they are called on to perform. These all have implications for the type of information staff recruited, the ways that they are educated and trained, and the position and status that they will require in order to perform effectively.

### ***Management Commitment and Support***

Above all, information specialists require the commitment and support of their

managers and policymakers. To obtain this, information specialists must demonstrate their value to managers, convincing them of the benefits to be obtained for the research system from investments in information.

Furthermore, information specialists need to understand and gain access to management decision-making procedures and mechanisms, and in the process gain an understanding of the environment and constraints that face managers and policymakers. This helps to get the message across and ensures that realism is a characteristic of information proposals and projects. Finally, those outsiders who have an influence on the organization, policies, and management of the institute or system should also be sensitized and convinced of the need for effective information management.

## Preface

Good access to information is essential for effective agricultural research. This is especially true for small countries where the research system must incorporate more information-intensive functions such as advice to policymakers or regulation of plant imports, as well as traditional experimentation. These functions mean that researchers and research managers must pay much more attention to the strategies and approaches they can use to assess and obtain high-quality information. They must also ensure that their research systems have suitable mechanisms and channels for sharing and disseminating useful information.

The central role of information management in small countries was recognized in the early stages of ISNAR's project on small countries. It has been of particular interest to ISNAR to combine the management of information with its ongoing programs to strengthen the overall management of

agricultural research in small countries. To this end, ISNAR and CTA jointly funded a meeting for information specialists in Mauritius. The task for the participants was to examine their own roles and functions with regard to the particular and changing requirements of research in small countries and to devise useful strategies for making more effective use of information in their own national agricultural research systems. This report highlights the main issues that were discussed during the meeting and presents the key lessons and conclusions.

Although ISNAR and CTA organized and funded the event, much credit is also due to the Mauritius Sugar Industry Research Institute (MSIRI) which hosted the meeting and facilitated all the local arrangements. Dr. Claude Ricaud and Ms. Rosemay Ng Kee Kwong deserve special thanks for their support and excellent hospitality.

## Abstract

**T**his report highlights the main discussions and conclusions from a meeting of agricultural information specialists from small countries. The meeting was part of an ISNAR project on strategies and policies for the management of agricultural research in small countries, which identified improved access to scientific information as a key part of effective agricultural research in small countries.

## Resumen

**E**n este informe se presentan las discusiones y conclusiones principales de la "Reunión de Especialistas en Información Agrícola en Países Pequeños." La reunión fue parte de un proyecto del ISNAR sobre estrategias y políticas para el manejo de la investigación agrícola en países pequeños. Este proyecto, identificó que en países pequeños con recursos limitados, el mejor acceso a la información científica es un aspecto clave para una investigación agrícola eficaz.

## Résumé

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**C**e rapport souligne les principales discussions et conclusions d'une réunion de spécialistes de l'information agricole des petits pays. Cette réunion rentre dans le cadre d'un projet développé par l'ISNAR sur les stratégies et les politiques de gestion de la recherche agricole des petits pays. Ce projet considère qu'un meilleur accès à l'information scientifique est un élément clé permettant une recherche efficace au sein des petits pays.

# Themes

The project identified three main aspects of information flow and management that can be expected to have a strong influence on the way information is accessed and managed in small countries. These are the *demand* for information

from research, the potential *sources* of information, and the *mechanisms* that managers use to identify and acquire it. The agenda for the meeting was developed from these themes and from the issues raised by the authors of the case studies.

## Responding to Demand

The meeting began by considering issues of "demand" from both research managers and scientists. Understanding the demands or needs of information users and understanding the factors that create and shape different demands are essential prerequisites for all other information activities. Presentations giving the information specialist's point of view elaborated on experiences from Mauritius and Trinidad and Tobago in dealing with demands. Both emphasized the value of strong contacts between research managers and information services.

The perspectives of policymakers were also presented — they emphasized the emerging and increasingly broad research agendas that now face small countries, the increasing numbers and kinds of organizations that are involved in agricultural research, and the implications for information specialists.

Since information specialists design their services to respond to the needs of researchers, it is most important that the underlying factors that determine what researchers themselves are doing are understood. With this understanding, information specialists can anticipate many of the demands that they will have to service. This requires information staff who are

also able to see beyond the researcher to the policy environment, which determines the priorities and broad program goals for research.

### *Dealing with Change*

In small countries, agricultural priorities and their demands on research are prone to change, and this poses a special challenge for the information specialist. Most small countries, especially those that depend on a few major export crops or those that are diversifying into alternative, and risky, nontraditional export commodities, are buffeted by international economic swings and market changes. These changes create pressures for agricultural research to be responsive and flexible and to be able to move quickly between research commodities and problems, depending on current needs. A major problem for the information service manager is to ensure that relevant information is obtained in time to support these changing research programs. The experience of Trinidad and Tobago (see box 1) shows one approach that has been successful in developing the contacts with research managers and policymakers that are necessary to anticipate future demands.

### Box 1. Early Warning System through Access to Policymakers

In the past, Trinidad and Tobago relied on a few export commodities, notably sugar, for much of its agricultural employment and some foreign exchange. In recent years, researchers in the public and private sectors have been looking for alternative crops and products to reduce the country's dependence on sugarcane. At the same time, the rising costs of imported agricultural products have generated a demand for increased attention to crops and livestock that can be grown or raised in-country to satisfy local requirements and to reduce import bills. These two factors, diversification and food security, have forced researchers to consider and experiment with numerous crops and agricultural products that might be profitable in Trinidad and Tobago, either for local consumption or for export.

The number of these research activities, and the country's fluctuating interest in each, has created challenges for the information service. Notably, to keep information services current, the information specialist must have an understanding of the policy changes

going on in the agricultural sector and be aware of which commodities are on their way up, or down. In Trinidad and Tobago, the strategy of the information specialists in the Ministry of Agriculture has been to broaden their role beyond traditional documentation to include activities such as editing, but more important, to also take on an active role in the management structure of the ministry. Thus, the librarian is part of the ministry's management committee and this is what allows the information unit to interact with policymakers and managers and to keep up with any changes in policy that may have implications for the research agenda. This high-level contact has been very useful as a way of keeping information specialists informed, and it also serves as a way of keeping managers aware of the information implications of their decisions. It is not perfect (not all decisions are taken in meetings) and other devices are needed to deal with personal interventions by influential policymakers that sometimes bypass formal channels.

This kind of high-level contact in the public sector serves to keep information specialists informed about systemwide issues and problems. The same kinds of contacts are needed at all levels in the research system. The experience of the Mauritius Sugar Industry Research Institute (MSIRI) demonstrates the value and benefits to be gained from involving information specialists in management bodies and processes within a research institute. In this case, the head of scientific information services is a full member of the management committee and interacts with the heads of the research units and divisions. This ensures that the information staff are aware of what is presently going on or planned in the institute, and it allows information services to be adjusted to satisfy new or changing demands.

**Lesson:** Information specialists must gain access to management and policy-making bodies. This keeps the informa-

tion service responsive to changing demands and it also reminds the managers and policymakers that information issues are as important for research in small countries as research itself.

#### *Emerging Research Agendas*

Small countries are sometimes in danger of being overlooked when global research issues are discussed at international and regional meetings. However, the implications of sustainability, environmental concerns, biotechnology (see box 2), and agricultural diversification are, if anything, more pressing and challenging for small countries. Small countries do not have sufficient capacity and staff to conduct research on all these issues, and the challenge is to find ways that they can benefit from the results of this research. This will involve substantial information screening and evaluation, and small countries will need to make use of a wide range of information approaches.

### Box 2. The Implications of Biotechnology

One of the changes sweeping through agricultural research systems worldwide is a growing appreciation of the role that biotechnology can play. Almost every national agricultural research system is involved, or soon will be involved, in biotechnological research which falls somewhere on a gradient beginning with traditional technologies, such as tissue culture, through to more advanced recombinant-DNA technologies. Keeping up with this rapidly changing field is difficult even in large and well-resourced research institutions; in small countries this task is even more daunting.

A small country has to recognize its limitations in the area of biotechnology and design its strategy accordingly. This means that libraries should build small, core collections of key reference texts, and perhaps a few journals, and rely more on external agencies to keep them updated on new developments and literature. Information specialists should work with their managers and policymakers to ensure that the high costs of access to this specialized information are covered from the

biotechnology research projects and programs themselves.

A special feature of a small country is that, for biotechnology at least, relatively little research will be conducted in the country. However, the implications of biotechnologies developed elsewhere will be felt in all countries, and policymakers will need to be briefed and informed about developments that are likely to affect the economy. This implies less attention to primary research documents and more emphasis on reviews and studies that synthesize and comment on policy issues and implications. There is an important role for external agencies and global information services to do this kind of work for small countries.

Information specialists in small countries must work with managers and scientists to ensure that traditional information sources and services such as library databases are used in combination with other information mechanisms, such as electronic conferencing, computer bulletin boards, and meetings.

## Information Mechanisms

NARS managers respond to their scientists' needs and demands for technologies and ideas by creating or promoting the use of various mechanisms to gain access to information. The information system in a small country is much more than a traditional documentation center or library — it includes research and information network arrangements; national, regional, and international linkages; information-exchange mechanisms, such as meetings, seminars, and workshops; as well as the interactions between these different parts.

The meeting in Mauritius concentrated on three of these mechanisms: libraries, information centers, and information networks. To a lesser extent, two other mechanisms — research networks and personal contacts between scientists — were also examined.

The case studies demonstrate the different intensities of use and development of different mechanisms in each of the countries. The meeting focused on Swaziland and the Seychelles, where the differences were most evident (see box 3). In Swaziland, the scientists in the ministry rely on research networks, while in the Seychelles, the move towards documentation centers is a recent development after long reliance on personal contacts between scientists.

The Swaziland situation is an example where the functions of a weak mechanism could be strengthened in areas that complement the strengths of other, existing, mechanisms. A development plan for library services in the ministry, for example, could recognize that current information is provided by research networks. It would highlight other informa-

### Box 3. Complementary Mechanisms

In Swaziland, scientists in the Agricultural Research Division of the Ministry of Agriculture rely almost entirely on research networks for *current* scientific information. In contrast, staff at the University of Swaziland's Faculty of Agriculture rely more on their library for current information. Thus, we have examples of two different information mechanisms, each carrying out the same "current-awareness" function. In the ministry, libraries are almost nonexistent and efforts to strengthen them have received little support from managers or researchers, possibly because so many information needs are satisfied by the networks. In the university, formal research networks are mostly insignificant.

In the Seychelles, personal contacts between scientists and between expatriate experts have been the main method used to locate scientific information. Only in the last two years have managers recognized the

problems associated with such a system, and they have started to create documentation centers to identify and store information produced in or about the Seychelles. Personal contacts have, in many ways, served the country well by providing direct linkages between scientists and experts with relevant skills and knowledge. But with high staff turnover, there has been little institutional memory created; information has been lost and the search process perhaps replicated several times.

Documentation centers are one approach to ensure that the information storage and retrieval function is carried out, while personal contacts are still used to locate specialized and current information. As in Swaziland, it is clear that there are different information functions that must be carried out (current awareness, storage, and retrieval) and that different mechanisms can take the lead role for each function.

tion functions or roles that are not covered by network activities. In this scenario, providing access to locally generated information, or disseminating external information that enters the country, or even acting as a storage and retrieval facility for scientists would become more important functions for the library service. The current awareness role (at least for outside information) that is already performed by the research networks would be relegated to a lower status.

Donor and technical assistance agencies increasingly consider research networks to be mechanisms that can be used to effectively strengthen agricultural research in small countries. Although the emphasis is very much on *research*, and the participants in these networks tend to be researchers, the basic commodities that are shared and traded are information and knowledge. These networks are channels for distributing up-to-date information to participating scientists; they also bring scientists into contact with one another through workshops and study

tours and offer an advisory and consulting service in response to problems or queries. In small countries, these networks can play an important role in the national agricultural research effort, and since much of their contribution to the research system is informational, their activities should be a major concern of information specialists.

Research networks are quite different from information networks whose main function is to promote the exchange of information, usually between information units. They may be general in nature (AGRIS) or more commodity-specific (bananas and plantains), but in all cases their activities in a small country need to be balanced against local priorities and availability of resources. In the same way that research networks direct national research efforts towards certain commodities or problem areas, the demands from participation in information networks can come to dominate all other activities in the information service.

## Sustainable Information Systems

A major issue for all NARS is to ensure that their information services are designed with sustainability in mind. The special characteristics of small countries mean that information projects usually incorporate a wide range of functions and mechanisms, and the constraints and opportunities imposed by small scale and limited resources must be clearly recognized and incorporated into the project's design. The meeting focused on information and documentation projects, particularly how they can be made more sustainable in the medium and long term.

Small countries, with their limited financial and human resources, are especially likely to suffer from unsustainable information projects. There are many instances where documentation projects in small countries have lapsed or where they only struggle along with insufficient resources, few users, and little sense of direction. Occasionally, they receive injections of morale-boosting interest and support from external agencies, but in the medium and long term they continue to suffer relapses.

These situations are the result of many factors, not the least of which are the dependence on very few information personnel, an extreme shortage of local funding, and a disinterested management environment. Perhaps they also suffer from an approach prevalent among international, donor, and technical assistance agencies that regards the organization of information services in the Seychelles and India, for example, to differ only in terms of scale. That a small country requires something quite different in the way information activities and projects are designed was one of the main messages to come out of this meeting.

The starting point for sustainable information systems is to ensure that they are appropriate to the needs of the country, and that they are designed to meet the real

needs of the intended clientele. This "realism" must be injected in the early stages of a project when systems and services are being designed and workplans drawn up. Reality comes from having knowledge about the users' needs, as well as some assessment of the organization's long-term willingness and ability to maintain the services. It requires contributions and commitment from information specialists and scientists, as well as the managers who make the final decisions.

At present, project design is often left to outside experts, decisions are taken by managers or policymakers, and implementation is left to semi-trained local staff, perhaps with outside assistance. It is not surprising therefore that sustainability is not a strong feature of many projects. This is largely because most small countries do not have the local expertise available to assess the research system's information needs, to design and assess options, and to implement the desired activity. A critical improvement would be to ensure that this expertise is available in the country and then to make effective use of it in these decisions. This requires well-educated and highly trained information staff.

Trained personnel alone are not sufficient to ensure the success of an information project. Funds and other resources for information projects must also be made available from national sources. These resources are usually committed to the project after donor funding ceases, and very often they either do not materialize or are insufficient. With better design, projects are more likely to remain within funding levels that the country can afford. Also, committing local funds in increasing amounts to a project from its beginning is one way to ensure that national budgets gradually take over the costs without any sudden shocks.

**Lesson:** Information systems and projects in small countries have many difficulties, especially after donor assistance has ended. This is made worse by a scarcity of local funds and trained personnel, but they can be resolved by

- recruiting and training local staff and involving them in project design;
- using innovative funding mechanisms;
- allocating resources from the national budget at an early stage;

- ensuring strong and sustained management and policy commitments;
- giving greater attention to the design of proposed projects and systems;
- providing effective monitoring and evaluation systems;
- generating user support and commitment through promotion and services;
- including an information component in all research projects.

## Division of Labor

Large countries have scattered facilities, large numbers of research staff, and numerous different organizations and agencies involved in agricultural research; coordination is essential to reduce duplication and increase efficiency. Though much smaller in scale, the same issues of coordination and cooperation in small countries were raised by all the case studies in the project.

In addition to national-level coordination, however, small countries must also invest substantial time and effort to ensure that they make the best use of regional and international information sources and services. If possible, they must also practice a division of labor or responsibility in which they delegate specific functions or activities to external agencies. In effect, this means that relevant parts of an external agency's activities would be treated as if they were part of the national information system.

The meeting discussed different ways for small countries to organize their information services in order to avoid duplication, achieve impact, and use their resources more efficiently and effectively. Participants considered the options and opportunities offered by regional groupings and organizations, specialized information centers, and global information providers.

## Regional Approaches

Collaboration and joint activities with other countries in a region are attractive options for small countries, not least because regional activities are often preferred by donors who do not want to support numerous small activities in each country. For information specialists, such collaboration can be extremely effective and can provide sufficient critical mass of trained personnel and resources to get many tasks done. It is particularly useful in staff development and training where few small countries can justify developing their own program. The opportunity to develop services and products from pooled resources which far exceed the resources of a single country is also especially important. However, as a small country becomes more proficient in its information management activities and, especially, in its use of information technology, the relationships between small countries and regional organizations need to change (see box 4).

The Caribbean Agricultural Research and Development Institute (CARDI), the Southern African Centre for Cooperation in Agricultural Research (SACCAR), and the Windward Islands Banana Growers' Association (WINBAN) are all examples of regional organizations that are also lo-

#### Box 4. Changing Roles for Regional Organizations

Regional organizations have tended to be technological leaders in the information field. They were the first to invest in computers and telecommunications equipment and have developed relatively sophisticated printing and duplicating facilities. The assumption was that the regional organization would use these technologies to serve their small-country members and that significant economies could be attained by concentrating expensive hardware in a central place.

Recent developments in microcomputers and telecommunications have reduced the costs of information technology while at the same time increasing the capabilities of the technology itself. The technological capability to create and manage databases and to gain access to information resources is, or soon will be, available to any small country at a

relatively low cost. This means that the nature of the relationship between small countries and regional centers will change. The role of the regional center will involve less data handling, with more emphasis on its function as a consultative forum and source of specialized expertise for its members.

The experiences of the Agricultural Information Bank for Asia (AIBA) show how information services from a regional organization can be completely overtaken by the spread of new information technologies in countries which previously relied on the regional center for access to databases and information support. AIBA has moved away from its database activities towards a role that is more focused on facilitating joint regional activities, training information specialists, and offering consultancy services and advice.

cated in small countries. Although they each differ in the way that they are organized and in their approaches to information, they are linked by the similarities of their constitutions and mandates, which emphasize support for the member countries that they represent. This *representational* characteristic is an important difference between regional organizations and other types of external agencies, and it presents an opportunity for small countries to directly influence the services and support that they receive.

CARDI was established by member states of the Caribbean Community (CARICOM) to serve the agricultural research and development needs of the region. It maintains a presence in each of the countries. In larger countries, CARDI staff work with the national research institute, while in smaller countries, much of the research that is needed is carried out by CARDI for the country. The activities and services of the CARDI Information and Documentation Centre are primarily aimed at CARDI staff and their collaborators throughout the region. CARDI collaborates with a wide range of national, regional, and international agencies in its efforts to obtain and deliver this information. It is also a regional branch office of the Technical Cen-

tre for Agricultural and Rural Cooperation (CTA), in which capacity it has a wider role in strengthening access to agricultural information in its member countries.

SACCAR was established by 10 southern African countries to be a focus for regional cooperation in agricultural research and to provide technical support for national agricultural research systems. Facilitating the exchange of information among member countries is one of its objectives. Information activities at SACCAR focus on the need to generate information from the region to improve coordination of research activities in member countries and to strengthen their national capacity to manage and gain access to information.

WINBAN is an example of a parastatal agency that was created and is supported by banana growers' associations in the four Windward Islands of the Caribbean. As well as conducting research on bananas, it compiles statistics on the banana industry and represents the banana growers in negotiations with buyers in other countries. The communication and documentation center serves the research staff of WINBAN, as well as farmers and growers in the four islands.

Most regional organizations believe that one of their roles is to strengthen and support the information services of small countries. In practice, the regional center often takes on some of the functions of the national information unit and provides services and products directly to managers and researchers in the member countries. Sometimes this division of labor is the result of a decision made by the regional center with little consultation with the countries concerned. While there may be some functions and services that should be carried out by the regional center, these must be decided by the country concerned, and the decision-making process should also involve information specialists from the country whenever possible. Regional organizations have great potential to assist small countries, but in order for small countries to make the most effective use of regional organizations, they must be able to influence and direct them.

Although contacts and exchanges with other countries in a region are important and offer economies of scale, there are some situations where a wider set of contacts outside the region must also be cultivated. For some countries, these contacts are developed with a seemingly random group of countries and institutions with whom the organization or individuals have somehow developed good relations. Not all these contacts can provide "global" information (information about almost any research topic that is applicable to almost any situation), and small countries should put specialized informa-

tion centers and providers of global information services high on their lists of potential collaborators.

### ***Specialized Information Centers***

There are now some 20 or 30 specialized information analysis centers (SIACs) or networks throughout the world. They concentrate on such topics as agroforestry or low-external-input sustainable agriculture, or on commodities such as buffalo, coconuts, sorghum and millet, bananas and plantains, and cassava (see box 5).

These specialized information centers are usually associated with centers of research excellence, and they use their scientific, computer, and information expertise to provide consolidated information products and services. The concept of a SIAC envisages a center that comprehensively acquires, stores, evaluates, synthesizes, retrieves, and disseminates information on a clearly defined subject area. In addition, staff from the center work closely with researchers in their subject area to deliver information services as well as customized products, such as reviews, journals, newsletters, monographs, and databases.

A major benefit to be gained from contacts with these specialized centers is the opportunity for a small country to obtain the high-quality, low-cost, reliable information support that it needs for a specific commodity or research problem. This removes the need for a small country to invest its own scarce resources in that

#### **Box 5. Seeking Specialized External Assistance**

One feature of information services that most small countries cannot afford to maintain is specialization, especially in one crop or commodity. Instead, they must specialize in being generalists with easy and quick access to specialists when they are needed. Apart from the large costs associated with effective specialization, the existence of several specialized information analysis centers (SIACs) means that small-country information special-

ists need only call on their services instead of trying to duplicate or replicate them. These centers are usually intended to serve developing countries, and their services are inexpensive and relatively easy to access. However, small countries have little influence over the priorities and activities of a specialized center and should work to develop collaborative arrangements that benefit both themselves and the center.

commodity, and national resources can be used instead to support other priority areas where information is more difficult or more expensive to obtain.

The way these information centers are organized to locate and deliver information could serve as a model for many small-country information units. In particular, elements of their proactive services, close interactions with scientists, skilled staff, and the variety of nontraditional products, roles, and functions might be borrowed and modified to suit the needs of many small-country NARS.

### ***Global Information Services***

Although specialized information centers provide a global service, their coverage is restricted to one or two specific commodities or thematic areas. There are a number of other organizations that offer information services and related products on all commodities, and their coverage is worldwide. Among the information services available are search and retrieval, document delivery, current awareness, question and answer, and the selective dissemination of information. These organizations are more than providers of information — they are also involved in various aspects of training for information specialists, advisory and consultancy services, and the development of tools and software that can be used by collaborating institutions. All of these activities are useful for small countries (see box 6).

Some of the many organizations that offer information services to the world are CAB

International (CABI), the Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), and the Food and Agriculture Organization of the United Nations (FAO).

CABI is an intergovernmental organization with its headquarters in the United Kingdom. Among information specialists, it is best known for its bibliographic database and the range of abstract journals that are derived from it. Increasingly, CABI is investigating the possibilities of compact-disk technology to distribute its database, as well as specific subsets (on forestry, for example). CABI runs annual training courses for agricultural information specialists, which, in the past, focused on the skills needed to make the best use of their products. These courses are now more general and discuss a wider range of issues that need to be addressed by managers of agricultural information systems. Recently CABI has become much more proactive in its work with NARS, especially to assist them in strengthening their national information systems.

CIRAD is a French development organization which contributes to the development of countries in the tropics by research, experimentation, and training. Although its information activities are largely focused on satisfying the needs of its own research staff, it is very active in document delivery and database creation, often through direct collaboration with NARS in Africa. Of particular interest is their work with databases, software, and text exchange. The tools they have developed are available to small countries and

#### **Box 6. Making the Most of Global Services**

Organizations with global mandates all have useful information products and ideas to offer small countries, but careful selection from the wide range of services that they produce is required. The strength of global information services is their wide coverage and the high likelihood that they can provide a small country with at least some of what it needs. There is a tendency for their services to

be rather general and intended for larger audiences, and they are therefore less likely to provide the in-depth, customized products that are needed to meet the very specific information requirements that may exist in a small country. In such areas, they cannot compete with the specialized information centers, one of whose main tasks is to expand and add value to the products of global services.

can be used to develop local databases or to exchange data between countries and organizations. They have also been pioneers in the production of databases on compact disk that contain information from a number of NARS as well as CIRAD itself, thus offering the latest technology to countries that would otherwise be unable to afford it.

FAO is the coordinating center for the AGRIS and CARIS information systems. AGRIS is a cooperative bibliographic database made up of contributions from participating countries and institutions; CARIS is a database of agricultural research projects. In exchange for their contributions to AGRIS, participating centers receive a copy of the global database either in the form of printed bibliographies or on CD-ROM disks. Another benefit from participation in these systems is the opportunities that they offer for a small country or group of small countries to build their own national or regional databases using the software and formats devised by FAO. FAO's other main role in small countries is as an executing, and sometimes funding, agency for projects to develop and strengthen national information capacities — often with increased participation in AGRIS or CARIS as a major goal.

Dealing effectively with global, international, and regional organizations means small countries must have a strong national mechanism to allow them to coordinate local activities and set priorities for cooperation with the outside world.

**Lesson:** The existence and services of external organizations must be recognized and deliberately incorporated and integrated into local activities and plans. Local information resources and services should complement what is available externally, and duplication should be minimized. This may require a small-country information system to deliberately give up a function or responsibility, or perhaps reduce its efforts in areas where others are stronger. The decision

on what to give up or contract out must rest with the country itself. Effective management of these relationships requires the small country to be able to do the following:

- determine and articulate its own information requirements;
- accurately assess its strengths and limitations in information management;
- evaluate information sources and external agencies, and select from what they offer or make available;
- influence the activities and priorities of external agencies.

### *Coordinating National Efforts*

The case studies show that although informal collaboration between information centers within a small country often exists, coordination is almost always lacking. Coordination is necessary to ensure that the activities and projects of different units do not overlap and lead to unnecessary duplication. There is also plenty of scope for participating information units to cooperate in the development of joint information products and services, and to share their limited resources. This requires appropriate local mechanisms for negotiating and implementing joint activities as well as for organizing and sharing information and knowledge (see box 7).

During the meeting in Mauritius, participants noted that the coordination function should be institutionalized, and if possible, linked with efforts to coordinate research. There was some concern that too informal a mechanism would not be effective and would soon become redundant. High-level support, access to policymakers, and a strong link with the national coordinating mechanism for agricultural research are essential to the effectiveness of such a coordinating body. This could be ensured by linking the two coordinating mechanisms together, perhaps by making the information coordi-

### Box 7. Coordinating National Activities

One of the biggest challenges for the information specialists in small countries is to devise a national structure that will allow information activities to be coordinated and developed through collaboration, without at the same time restricting the independence and local accountability of individual information units. Although no clear recommendation emerged from the Mauritius meeting for the best design of the coordinating function, it is clear that participants in the coordinating mechanism should not be restricted to research organizations alone — they should represent

all agricultural information units in the national agricultural system.

Its major roles are to determine the real information needs of the country's scientists, to channel information from external aid institutions as well as between the different participants, to assign different tasks and responsibilities to the different centers in the network according to their specializations and resources, to play a public relations role at a national and regional level, and to organize training opportunities.

nating group a subcommittee of the research coordinating body and by ensuring that each is represented on the other.

Although primarily responsible for consolidating national policy and priorities for information activities, a central coordinating body is also an essential ingredient for a national agricultural information network that may have a wider range of roles and functions. Increasingly, single institutions are unable to deliver all the services that their staff require, and they must turn to other institutions and agencies for assistance in some areas. A cooperative network approach in which all centers participate according to the level of their resources and interests is advocated. Overcentralization should be avoided so that each participating center can both contribute and receive resources and services.

Many small countries have experimented with information networks, both formal and informal. In countries such as Rwanda and Burundi, the networks are well-organized and active and they provide a useful way for researchers and other agricultural professionals to gain access to a wider range of national information resources. In other countries, the experience has been less positive. In Cape Verde for example, there are very few in-

stitutions with functioning information units that are able to participate effectively in a network, and this has reduced its impact. A minimum critical mass of trained staff and functioning information units must exist before the network can operate as a network, and not just as a series of ad hoc contacts between individuals or institutions.

**Lesson:** Information units in small countries must pool their resources and efforts and work to satisfy the broad demands of their research clientele. Duplication and fragmentation can be reduced by

- establishing a mechanism to coordinate (but not necessarily to implement) national activities in agricultural information;
- sharing responsibilities and activities among all centers;
- consolidating some functions, depending on comparative advantage;
- ensuring a strong link with a research-coordinating mechanism;
- encouraging participation, collaboration, and a holistic view of the information system;
- managing and influencing outside agencies and their interventions.

## Staffing Issues

The final issue considered during the week was human resources, in particular, education and training. All of the case studies highlighted the problems for information managers who try to meet their goals with very limited human resources, both in terms of numbers and skills. Given the extremely small number of trained information personnel in small countries, and the broad range of roles and functions that they must perform, it is essential that high-calibre, well-educated staff is available and that proper attention is paid to their continuing training needs.

Highly educated staff are essential. In order to keep up with the rapid changes in the profession, however, their education must be supplemented, complemented, and updated by a process of continued training. A problem in most small countries is that managers, donors, and even information specialists settle for short-term training as being sufficient for their needs and see little requirement for longer-term education. Institutions generally prefer training over education because it offers opportunities to bring new skills into the country, quickly and

cheaply. However, education is absolutely essential for top-rate services as it provides the "intellectual tools" that are needed for professional activities such as planning, financial management, coordination, setting priorities and policy, and dealing with researchers and managers on an equal basis (see box 8).

This education is required in aspects of information and library science, as well as in other areas such as agriculture, knowledge systems, extension science, or rural development. In small-country situations where the information specialist must be far more than a technician and must work in "nontraditional" situations and disciplines, this broad-based education is essential to the development of effective information services for research.

Qualified information specialists must be able to understand the management, policy, and research environments in which they operate, and they must become more aware of the changing information needs of researchers and of the different sources of information that can be used to satisfy them. Effective information management therefore requires some knowledge of ag-

### Box 8. Education and Training Are Both Essential

Very few information specialists in small countries have the necessary education *and* training that are required if their full range of roles and tasks are to be done effectively. Most have received some short-term training; few are educated to the broader functions that they should perform, and this restricts them to mainly traditional activities and processing technical information.

*Education* is long-term, broad-based, and aims to produce a background of concepts and a theoretical framework within which the participant will be able to function. It provides the understanding of principles and underlying assumptions that lie behind immediate tasks and puts them into a broader context.

This makes it possible for the information specialist to be flexible, adaptable, and able to respond to the new challenges that dominate small-country situations.

*Training* is short-term, is focused upon a single objective or a small number of objectives, and aims to impart the specific skills or techniques that are necessary to implement required tasks. It tends to offer a solution to immediate problems for which education is inappropriate or too long. Training should be seen as an investment in the country's research agenda. Information specialists need to be on the lookout for relevant training and continuing-education courses that are offered by international and regional institutions.

riculture to provide useful services and to gain credibility with research staff, as well as information handling skills to provide the tools and approaches necessary to acquire and manage data.

Furthermore, the information specialist, by providing information that can be used in deciding research policies and programs, is involved in the research process itself and should be seen as a full member of the research management team. This means that the information specialist must have sufficient qualifications and status to communicate as an equal with scientific staff and managers — which reinforces the need for educated information staff.

**Lesson:** The roles and functions of information specialists in small countries suggest that

- longer-term, broader education is perhaps more important than skill training;
- a combination of information skills and agricultural knowledge is best;
- educational and professional status equal to that of researchers will facilitate communication and effective participation by information specialists.

### ***Reducing Professional Isolation***

Participants at the meeting in Mauritius also considered the issue of professional isolation. Special activities would seem to be justified to keep information staff in small countries in contact with colleagues and up to date on developments in infor-

mation management and technology. The scarcity of trained information staff in a small country reduces the opportunities that staff have for interacting and discussing common problems and experiences with colleagues. This means that they must look outside the country for professional stimulation and support. Ways to overcome the geographical and organizational isolation that faces information staff in small countries include training, attendance at seminars or conferences, membership in a professional association like IAALD (International Association for Agricultural Information Specialists), and participation in information exchange networks. These activities develop the personal contacts that are so essential for small-country information specialists, who should receive support and encouragement from their managers for these activities.

**Lesson:** Study tours, training courses, and attendance at workshops and seminars are effective ways to reduce isolation. They allow information specialists to accomplish the following:

- obtain practical experience;
- collect information directly at its source;
- establish and maintain contacts with colleagues;
- avoid duplication of effort by sharing experience and information;
- obtain expertise on specific professional or information-related problems.

## Follow-up

Although the Mauritius meeting was intended primarily as an opportunity for information specialists to comment on the issues raised by the ISNAR/CTA project, participants also discussed future activities that could follow up on the meeting. Most suggestions tended to be ideas rather than proposals that could be taken up by the countries themselves or by donor agencies. However, some specific lessons and conclusions were drawn from the discussions, and these formed the basis for presentations at the workshop held by ISNAR during the following week for managers of agricultural research in small countries.

There were a number of specific suggestions and requests for follow-up by ISNAR. These included requests that similar meetings be arranged, perhaps on a regional basis. Other requests were more concrete — for activities that could directly strengthen the ability of small countries to locate and deliver the information that their scientists require. Given the competing demands on ISNAR's limited resources, the follow-up activities that can be expected from ISNAR include the following:

- editing, synthesis, and redissemination of the various papers prepared for the meeting;
- incorporating the conclusions and lessons from the meeting into future ISNAR work in small countries.

An important audience for the issues raised during the meeting are the donors and technical assistance organizations that work with small countries. It is important that they consider their own approaches and interactions with small countries to discover whether they can be improved. CTA, for example, is encourag-

ing countries to form local focal-point committees for its activities in each country. Discussions during the meeting suggest that the mandate of these committees could perhaps be broadened to support other information functions in a small country and that they could be more than just channels to disseminate CTA products and services.

Many other ideas and suggestions arose from the meeting but require interested organizations to fund and implement them. A newsletter focused on small-country agricultural research and information systems would be a useful forum for discussing the issues from the meetings as well as exchanging experiences and news. Although a newsletter would primarily inform staff in the small countries themselves, it might also be a useful vehicle for sensitizing donors and national policymakers on the information constraints and opportunities faced by small-country information staff. Certainly, every opportunity should be taken to promote the information management message at meetings of donors, research managers, or policymakers.

One problem identified by participants was the lack of documented evidence demonstrating the benefits that result from improved information management or greater investment in information services. Managers need to be convinced that the resources for information work are used effectively. And research is needed to demonstrate the impact or rates of return that can be expected from investments in information. All of these ideas should be followed up — either by information specialists in NARS, by donors, or by other organizations with an interest in improving the management and flow of scientific information to small-country NARS.

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