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INFORMATION MANAGEMENT NEEDS IN NATIONAL AGRICULTURAL RESEARCH SYSTEMS

Developments in telecommunications and computers are revolutionizing agricultural research. New information technology has the potential to improve the quality of agricultural research, the efficiency of its management, and the relevance and timeliness of research results. Scientists and managers can now access more information than ever before. At the same time, they can disseminate information to users more easily. By the end of the century, full text retrieval and multimedia applications are likely to be commonplace. The impact of such new technologies on many national agricultural research systems (NARS) is slight at present, but growing.

But national agricultural research systems (NARS) face a critical management challenge with regard to information. Supply of and demand for information technology is moving ahead of the capacity to manage it. NARS must therefore move quickly if they are to get the most out of new resources and avoid future management headaches. Solutions to problems of information content, collection, access, users, and potential overloads are a high priority.

To address these issues ISNAR, CAB International, and the Technical Centre for Agricultural and Rural Cooperation (CTA) organized a small international consultation in January 1993. Participants included representatives of NARS, donor agencies, and the three sponsoring organizations. The consultation followed discussions between the sponsoring organizations and, more importantly, meetings of research and information specialists and of NARS leaders.

This Briefing Paper reviews the themes discussed at the January consultation. It identifies major issues of information management in NARS and presents options for improvement in each. A final section outlines information management challenges for both donors and NARS.

Need for a Common Vocabulary

The term information management can be defined in many ways. It can include the management of library and documentation services, computers, telecommunications and electronic networking, publications, internal communication, management information, experimental data, statistical information of various kinds, and geographic information systems (GIS). In most NARS, however, it is defined more narrowly as one, or perhaps two, of these activities.

While recognizing the differences in users, approaches, and techniques in each of these

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areas, a broad view of information management is useful as a way to identify and clarify the linkages and relationships between the different parts. Such a systems view allows managers and information specialists to see how seemingly unconnected information activities complement (or duplicate) one another. It also highlights the pervasive nature of information throughout an organization and suggests opportunities for cooperation and rationalization.

At the same time managers must be careful to ensure that their systems approach does not go too far and lead to the creation of single organisms with unmanageable mandates. While valuable conceptual and practical connections can be achieved through a holistic view of information management, there are significant differences between the constituent parts that limit their consolidation into a single unit. Managers must seek a balance that encourages diversity in information services, while maintaining their overview of the whole information system.

Defining information management needs

Many people involved in information management issues are beginning to recognize that more clarity is required in discussions of "needs". A prerequisite for good information management is a rigorous assessment of the information needs of both scientists and management. However, issues of managing an information system are also important. Most information workers continue to focus on the needs of researchers and managers rather than on the management issues involved in satisfying their information needs.

It is clear that a distinction needs to be drawn between the information needs of the users and the needs of a manager of an information system. Scientists need information about a specific problem. They want literature, data, ideas, or expertise. A planner or manager, however, wants to know what facilities and equipment are needed so that scientists can identify and access information and disseminate their findings.

This means that NARS leaders should view information in both substantive and managerial terms. Assessments made of information needs should do more than just identify useful products for policymakers, managers, scientists, and farmers. Needs assessments must also evaluate issues of organization, resources, and technologies. Both information professionals and managers face an increasingly urgent challenge in dealing with this mixture of substance and management because as the costs of new technologies fall, the opportunities for making expensive mistakes grow.

At the January 1993 international consultation on information needs in NARS the discussion focused on several key themes:

- scientific and technological information
- information technologies, especially CD-ROM, and their management
- management information
- communicating and disseminating information

Recommendations on Terminology

- **Take a broad view of information management.**
- **Be precise about the information management functions that are to be performed.**
- **Understand the connections between types of information and their management structures.**
- **Clarify which needs are to be addressed.**

Theme #1—Scientific and Technological Information

Scientific information has two audiences: inside the organization and outside. Each has different needs. To meet these needs requires the performance of five related information management activities.

1. Identifying users of information and their needs.
2. Collecting information produced within the organization.
3. Identifying relevant information sources outside the organization.
4. Developing procedures to gain access to both internal and external information.
5. Disseminating information to users.

Each of these activities is becoming increasingly complex. Information specialists agree that the following trends are likely to continue:

- First, there is an increase in the number of ways that information can be identified and obtained. Libraries and documentation centers, electronic mail and conferencing, networks of all kinds, meetings, and personal connections are all being used.

- Second, there is an increase in the number and variety of information sources. For each "new" subject like biotechnology, biodiversity, natural resource management, or the environment, NARS must develop contacts with new information sources. Many of these are outside traditional national and international agricultural research systems.

In the face of such complexity perhaps the biggest information management challenge is needs identification. Scientists are usually unable to specify exactly what information they need. And information specialists find it increasingly difficult to identify the needs of the people they serve. Some of the worst problems, especially with investments in technologies, arise in cases where needs are thought to have been clearly identified. The conclusion: if the process of information management can be seen as a chain, needs identification is the weakest link.

In many NARS, the number of scientific documents and formal reports produced is limited. The result is that the focus of information management efforts is understandably on access to international sources of knowledge. But more attention must be paid to information resources and decision making at the national level, where NARS information managers have considerable scope to improve the production and organization of and access to such materials. High priorities therefore include training in writing and editing, cataloging of national holdings, and development of new procedures to identify, access, and promote the use of these holdings.

Nonetheless, external donors and technical cooperation agencies should remain active in providing information products and services to NARS. This support is an important supplement to national activities and is a gateway to information from elsewhere. At the same time, NARS should urge external agencies to assist in national efforts to capture indigenous knowledge, which is often lost, and grey literature, and to support the building of national data bases.

Recommendations on Scientific Information

- **Improve information needs assessments by involving information staff more closely in the activities of researchers and managers.**
- **Assign responsibility and resources for managing scientific information to a specialized unit in each research institute.**
- **Recruit and train staff with appropriate information skills.**
- **Create and strengthen national data bases and services.**
- **Support national efforts to plan and implement coordinated information systems for sharing scientific information.**
- **Assess the content of international data bases in relation to local needs.**

Theme #2—CD-ROM Data Bases and Information Technology

Information technologies are increasingly inexpensive and offer many opportunities for information storage and handling. However, the indirect costs are high and growing. Often bad strategic investments in technology divert scarce resources that could be used more productively elsewhere. Frequently managers recognize the importance of effective and sustainable technology acquisition and management only after significant investments have been made. A guiding principle for investing in information technology is that managers should have a clear understanding of the projected uses and applications of technologies and an implementation plan that sets out priorities, budget, and human resource requirements.

Since it is common to see personal computers and compact disk (CD-ROM) installations in use in NARS, this technology was used during the consultation as an example upon which to base discussion. Four main topics were covered.

Existing data bases

Many data bases have been available only in printed form or online through commercial data base services. Now CD-ROMs are proving to be a useful way for NARS to gain access to large scientific data bases. An emerging issue, however, is the balance in these data bases between national and international material.

NARS must ask what priority is (or should be) placed on access to international material as opposed to local documentation.

Potentials for data base development and dissemination

The fact that international data bases include only part of the literature produced by NARS in developing countries does not mean that coverage cannot be expanded. Specifically, NARS can create their own national data bases. They can then feed this material to international data bases and put it on CD-ROM for their own use. However, first NARS must evaluate the relative advantages of hard copy versus data bases on CD-ROM.

Access and training

The cost of CD-ROM hardware is falling, but the cost of the international data bases that run on it is not. As a result, NARS must carefully weigh the costs and benefits of introducing CD-ROM. One option lies in donor-supported packages of hardware, disks, and training. These reduce the initial start-up costs associated with the technology. However, NARS still must ask who should be trained in the use of the technology. If information specialists only, then how will scientists be able to browse through data bases (as they do now with hard copy)? Or, alternatively, if scientists are to be trained, then how can the use of the technology by large numbers of people be regulated?

Dependency

Most decisions about the content of international data bases are made in developed countries. If NARS begin to make widespread use of such data bases, procedures must be developed to take developing country needs and priorities into account. The burden is therefore on NARS to formulate long-term information plans which include both acquisition of international data bases and development of national information resources.

Also discussed under the information technology theme was the rapid introduction into NARS of different information technologies and philosophies about information systems. NARS participants reported that they are already experiencing problems of incompatible hardware, multiple data bases (often covering the same subject), and repetitious data collection. The single biggest problem is the absence of staff qualified to make technology policy decisions at a sufficiently high level. Such staff would be well placed to address problems such as compatibility and standards before investments are made.

Recommendations on Information Technology

- **Recruit staff with information technology management skills.**
- **Integrate applications through planning and common standards.**
- **Aim for compatibility in hardware and software—this normally requires adoption of institutional standards.**
- **Adopt international standards that facilitate information sharing and lower the development costs of data bases.**
- **Analyze the hidden or indirect costs of technologies being considered for adoption.**
- **Reduce software, hardware, and data base development costs through collaboration.**

Theme #3—Management Information

For many research and information specialists there is no clear distinction between scientific information and management information. The key point is really definitional. If the main criterion is content, then the distinction becomes obvious. However, if the main criterion is use, then the distinction becomes fuzzy.

Management information consists of administrative data such as on personnel, finance, supplies, and physical facilities, and program data, such as research content, targets, progress, and results. Managers use both types of information in setting priorities, planning programs, and evaluating outcomes. Scientists, also, use both types of information in planning experiments.

At first it may seem that overlaps in the uses of information can best be addressed with two different kinds of management information system (MIS). The first might concentrate on administrative data, the second on program data. However, a better solution is to organize management information in one system, with different parts of that system available to different users. While a

research manager needs access to both administrative and program data, a personnel officer or comptroller probably needs only the former.

One information management function of particular relevance to management information is updating. Data on personnel, finance, supplies, and physical facilities—as well as that on research content, targets, progress, and results—are only useful if they are current. The need to keep such data up to date means that NARS must pay considerable attention to the development of uncomplicated and sustainable data collection and processing methods.

Recommendations on Management Information

- **Take a broad view of the content of management information.**
- **Integrate information from different sources to meet the differing needs of scientists, administrators, senior NARS officials, and policymakers.**
- **Pay particular attention to the updating of management information.**
- **Try out different contents, data collection methods, and user formats before settling on the final shape of an MIS.**

Theme #4—Communicating and Disseminating Information

Research that is completed but not written up has little value. However, in many NARS a significant problem is that not enough research is documented, which means that it cannot be disseminated or referred to in the future. Appropriate formats and dissemination mechanisms vary from user to user. Extension workers and farmers, for example, prefer personal advice, meetings, demonstrations, and radio broadcasts over formal reports and papers. Communication with such users is being handled reasonably well in most NARS.

The dissemination of research results within the research community itself is one of the biggest challenges facing NARS. Not only is information among scientists not being exchanged in systematic ways, but the institutional memory of research is being lost. Three problems are especially significant: inappropriate incentives to publish, inadequate writing skills, and insufficient publication outlets.

Incentives

NARS place many competing demands on the time of researchers. In some NARS, scientists must spend too much time attending meetings, traveling, and doing research—rather than writing up their research results. In other NARS, there is concern that the pressure to publish may be distorting research priorities. Nevertheless, in many developing counties the main criterion for promotion is seniority rather than published output. In these latter situations, NARS may ask what can be done to encourage scientists to write, and how they can ensure that what is written appears in the most appropriate places.

Skills

The issue may not be one of incentives (for example, rewards and promotions), but rather one of skills. First, most NARS scientists need training in report writing. Second, even when scientists do produce reasonable draft reports, most NARS lack appropriate editorial and production support staff. In addition, NARS frequently have difficulty in finding the technology and the resources to produce appropriate reports.

One solution to this set of problems is a well-staffed editing and production unit. A major responsibility of such a unit would be to train scientists in report writing. External donors and technical cooperation agencies could play a major role in helping NARS to establish units of this kind.

Publication outlets

Even if NARS scientists are able to produce reports of publishable quality, it is often difficult to find places to publish them. International, refereed journals are often so demanding in terms of content, style, and supporting documentation that they exclude NARS scientists. Such journals often do not want the reports of adaptive research that are the most common products of developing country NARS.

To address these difficulties, external agencies could assist with support for specialized national, regional, and commodity journals. The objective would be to capture research results which otherwise might not be written up or disseminated.

Recommendations on Communicating and Disseminating Information

- **Develop incentives for scientists to write up the results of research (whether or not such reports are formally published).**
- **Support training programs to improve the writing skills of scientists and the editing and production skills of information specialists.**
- **Develop new outlets for scientists to disseminate their research results.**
- **Support national, regional, or other journals for which NARS scientists can write.**

Challenges for NARS and for Donors

Awareness and commitment

An awareness of the value of information is essential in NARS, along with a willingness to invest in improving existing systems and technologies. Most information professionals in NARS already have this awareness. The challenge is to broaden awareness among senior managers, policymakers, and donor agency staff—all of whom tend to see improvements in experiments, scientists' training, and equipment as more important for research than good information management. Two general ways to encourage awareness are workshops (to inform people about the technology) and demonstration projects (where they can see it and use it). Awareness should lead to commitment.

Trained staff

A common constraint is the lack of qualified professionals to manage information systems and services. It is rare to find a computer specialist in a NARS. There are few trained editors and communication specialists, and, while documentalists and librarians do exist, their training is often rudimentary and their status closer to clerical support than professional colleague. Too often, research organizations rely on a scientist with a spare time enthusiasm for computers to manage their information technology. Enthusiasm is desirable, but it is insufficient to provide the long-term support that is required to implement institutional computerization and stay abreast of developments. All aspects of information management nowadays are complex. They represent major financial investments and their management requires professional expertise.

Planning and needs assessment

NARS rarely carry out a systematic diagnosis of their information needs, they do not have assessments of their information infrastructure and resources, and they usually have no strategy or plan that provides a framework for information system development. As a result, they tend to be reactive rather than proactive in the design of information projects and activities. Attention to planning allows a national institute or system to lay out its own information future and to gain some control over projects in which it may participate.

There are many initiatives to strengthen components of NARS information systems. There are training courses, consultants and experts, CD-ROM sites, book and journal donation schemes, on-line data bases, microcomputer networks and software, data bases of grey literature, and numerous conferences and consultations. While these may all be useful, their impact in NARS is limited because they rarely fit into a locally defined plan for directing and strengthening information activities.

Before allowing major investment in information management, NARS must insist on thorough needs and technology assessments. What kinds of information do policymakers, managers, and scientists need? What will be the likely costs and benefits of making such information accessible to them? What technologies are most appropriate?

Since information activities are designed in response to the needs of an organization or individuals within it, there must be a clear link between the information strategy or plan and organizational goals, strategies, and plans. Ensuring that this linkage is effective normally requires that information specialists work alongside researchers and managers in a team and that information planning is integrated with other research planning exercises. The major responsibilities of the team are to establish the policy framework for information management, assess information needs, design a sustainable information system, and then a plan of action for its implementation.

Planning an information system requires substantial national capacity and expertise. These are very limited in NARS at present. Because of this, few countries or organizations have a plan for their investments in information and none have taken a broad view of the information function as a whole. Given the complexity

of the exercise and the knowledge of local information needs that is required, developing national capacities in this area is essential if NARS are to design and manage their own information systems.

Sustainable information systems

One key result of good planning is an information system that can be sustained in the long term with national resources. Funding agencies have a responsibility to ensure that the activities they fund are sustainable. They, especially, are prone to assign the blame for unsustainable or unsustained systems to NARS organizations. They often do not take enough responsibility for ensuring that their projects are designed with regard to local needs, resources, and capacities.

Sustainable systems result from concerted action by information specialists, research managers, national policymakers, and funding agencies. Research managers and policymakers ensure that the information environment is positive—that it enables effective information management. The information specialist is responsible for the relevance of information activities to the needs of users, and for marketing products and services, demonstrating value for money, and developing awareness of the value and usefulness of information in the national context.

Outside of the NARS, there are many potential partners and collaborators in the improvement of information systems. Some contribute expertise, some deliver information, and all offer advice. Their main weakness is an enthusiasm for implementing projects without first paying sufficient attention to information needs and overall system design and planning. In these situations, the driving force for national activities must be the NARS itself. The role of donors and others is to provide support for national commitments, rather than to formulate and implement projects themselves.

Priorities for NARS

- **Develop national information strategies and plans.**
- **Build national capacity to design and implement these strategies and plans.**
- **Use local expertise for local plans.**
- **Involve researchers, managers, and information staff in planning.**

Priorities for Donors

- **Raise awareness of the importance of information and the need for planning information systems.**
- **Support demonstration projects that illustrate the benefits of well-planned investments in information management.**
- **Support NARS in the development of their information strategies and plans.**
- **Assist NARS in priority setting for information management.**
- **Derive agency priorities from NARS priorities.**
- **Train national personnel in information management.**

About this Briefing Paper....

This Briefing Paper was prepared by ***Peter Ballantyne*** *and* ***Byron Mook*** *with contributions from* ***Margot Bellamy, N'Guetta Bosso, David Heydon, Janet Kaaya, John Komen, A. Michelle Luijben, Colin Ogbourne,*** *and* ***Paul O'Nolan.*** *It is a summarized proceedings of the Consultation on Information Management Needs in NARS held January 11-13, 1993 in The Hague, the Netherlands. The consultation was organized jointly by ISNAR, CAB International, and the Technical Centre for Agricultural and Rural Cooperation (CTA). It followed discussions between the three sponsoring organizations and, more importantly, a meeting of information specialists held in Mauritius, April 20-24, 1992, and a round-table dialogue between the leaders of NARS in Africa and the directors general of the international agricultural research centers held in Kenya, June 15-16, 1992.*

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