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Library Networking and Resource Sharing in the NARS and Possible Role of IARCs

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ABSTRACT: Inadequate funds and skills, poor access to databases and information technologies, and isolation of information workers in the National Agricultural Research System (NARS) provide strong reasons for networking among NARS and International Agricultural Research Centers (IARC) libraries. Pre-requisites for library and information networking include a clearly defined problem shared among the potential participants; evidence of strong self interest in the network; a commitment of resources such as personnel and facilities; representation in the network by trained personnel; and strong leadership. Planning for networks begins with a clearly defined and agreed set of objectives. Guidelines on choice of network participants, the kind of resources that are possible to be shared, the role that new information technologies could play, and the possible role of IARCs are discussed.

RÉSUMÉ: Face aux ressources techniques et financières insuffisantes, au pauvre accès aux bases de données et aux technologies en information, ainsi qu'à l'isolation des spécialistes de l'information dans les Systèmes Nationaux de Recherche Agricole (SNAR), les bibliothèques des Systèmes Nationaux de Recherche Agricole (SNAR) et des Centres Internationaux de Recherche Agricole (CIRA) ont de bonnes raisons pour se mettre en réseau. Pour installer un réseau d'information et de bibliothèques il faut, au préalable: un problème clairement défini et commun à tous les participants potentiels, un intérêt évident pour le réseau, une prise d'engagement au niveau des ressources humaines et techniques, une représentation au sein du réseau par une personne qualifiée, et un dirigeant puissant. Au début de la planification d'un réseau, il faut définir des objectifs clairs, acceptés par tous les participants. Cet article présente les lignes

directives pour la sélection des participants d'un réseau, les différentes ressources qui peuvent être mises en commun, le rôle que pourrait jouer les nouvelles technologies en information, ainsi que le rôle potentiel des CIRA.

RESUMEN: Los recursos financieros inadecuados, las capacidades poco desarrolladas, el acceso deficiente a bases de datos y tecnologías de información, y el aislamiento de los especialistas en información del Sistema Nacional de Investigación Agrícola (SNIA) son buenas razones para establecer una red entre las bibliotecas de los SNIA y las de los Centros Internacionales de Investigación Agrícola (IARC). Hay varios requisitos previos para crear una red de bibliotecas e información: que los participantes potenciales comparten un problema claramente definido; que exista un gran interés propio en la red; que haya un compromiso de recursos, como personal e infraestructura; que la representación en la red sea con personal capacitado; y que haya una marcado liderazgo. La planeación de una red comienza con una serie de objetivos claramente definidos y aprobados. Se discuten las pautas para escoger los participantes de la red, el tipo de recursos que posiblemente se puedan compartir, el papel que las nuevas tecnologías de información puedan desempeñar, y el posible papel de los IARCs.

ZUSAMMENFASSUNG: Unzureichende Mittel und Fähigkeiten, schlechter Zugang zu Datenbasen und Informationstechnologien sowie die Isolation des Informationspersonals im National Agricultural Research System (NARS) sind zwingende Gründe für einen Verbund zwischen NARS und den Bibliotheken der International Agricultural Research Centers (IARC). Voraussetzungen für einen Bibliotheks- und Informationsverbund sind u.a. ein klar definiertes gemeinsames Problem unter den möglichen Teilnehmern, Gründe für ein starkes Selbstinteresse an dem Verbund, die Bereitstellung von Mitteln wie beispielsweise Personal und Einrichtungen, die Repräsentation des Verbundes durch ausgebildetes Personal und

eine starke Leitung. Die Planung für einen Verbund beginnt mit einer Reihe von klar definierten und abgestimmten Zielen. Regeln über die Auswahl der Netzteilnehmer, die Art von möglicherweise zu teilenden Mitteln, die Rolle, die heute Informationstechnologien spielen könnten und die mögliche Rolle von IARCs werden diskutiert.

The concept of networks is not new to the national agricultural research systems (NARS) of the developing world. Many NARS participate in research networks with other NARS and/or international centers to promote collaborative research, exchange of germplasm, transfer and sharing of research-based knowledge, skills, and technology. In all such networks, information is exchanged as input to and output of the research, planning, policy formulation, decision-making, problem solving, and human resources development processes. Libraries and documentation centers in the NARS and international agricultural research centers (IARCs) are seen as resources that can be tapped by researchers to satisfy their information needs or that of their colleagues in the network. Libraries are often the conduits through which certain types of information flow into the research network.

Not much has been done to formally network libraries in the NARS and IARCs. The potential of a well coordinated international library network with country, sub-country or regional sub-networks to provide wide and efficient access to certain types of information needed by researchers, planners, policy makers, extensionists, and academics has not been fully appreciated and exploited.

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The lack of an understanding of the value of library and documentation services by policy makers, the difficulty of measuring the impact of library services, and the relatively low investments that library services receive in NARS and IARCs as compared to research are some of the reasons for the lack of attention to the establishment of library networks to address the information needs of NARS and IARCs.

This paper describes the rationale for library networks in the NARS, the kinds of resources that are possible to be shared, the role that new information technologies can play in such networks and the possible role that IARCs can play in such networks.

The Rationale for Library and Information Networks in NARS

A study by the International Service for National Agricultural Research (Stoop, 1988), on the important linkages that NARS need in order to achieve their goals, points out that in most NARS, linkages that would ensure the regular flow of information between researchers and extension agents, farmers, policy makers and the public are either missing or weak. Since even a large research system cannot generate all the technologies it requires, an effective NARS must have the capacity to borrow both knowledge and materials from the entire world (Ruttan, 1987). For large countries, this capacity to borrow both knowledge and materials is desirable and complements the in-country capacity to generate technology. For small countries, where resources for technology-generation are scarce it becomes essential to be able to borrow. The capacity of technology generators, intermediaries, and end-users to generate and utilize information is considered to be an important element in enabling NARS to meet their objectives of technology generation and diffusion.

Libraries and information centers

in NARS are set up to provide access to knowledge in documentary sources. Their objectives are to collect, collate, process, and disseminate information in published or near published documents and other sources of information. They develop databases, and provide information retrieval, dissemination, and document delivery services. It is well known that many NARS lack the 'critical mass' of resources and skills to fulfill the objectives with which they are set up. Many of them cannot function as effective elements in the information transfer chain as they are not proactive providers of information to the research system, for example, as elements that would facilitate the borrowing of needed knowledge and materials in the pursuit of research thrusts and objectives, and in the strengthening of linkages between research and extension, farming, policy making and so forth.

The 'critical mass' of funds, skills, information technologies, and other resources that NARS libraries will need to effectively contribute to the research programs of their countries is not easily achieved because most NARS are quite constrained for resources. Also, as pointed out by another study (Ballantyne, 1991) managers outside the library/information unit determine the size, scope and shape of the unit, allocating resources needed for it to carry out its tasks. Research managers decide what kind of information service they require and can afford, and they set priorities for service and clientele. This level of management often receives little attention, and information specialists operate in an unformed vacuum without the support and guidance necessary for effective use of information.

Writing about agricultural information in developing countries, (Harris, 1990) says that isolation—geographic, intellectual, organizational and cultural—are among the most common problems of information workers in the developing world. This has profound effects on collection building, access to journals, documents,

databases, information technology products and services, and gray literature. More importantly, isolation could seriously demotivate information specialists from giving their best, thereby perpetuating information work to the existing low level of importance in developing country agricultural research and in the over dependence of researchers in NARS on developed country and IARC information sources, systems and services.

One way out of the situation caused by inadequate resources and isolation is to establish formal library and information networks in which NARS of a region become members along with IARCs and other international agencies. Some networking is already in place with exchanges of one kind or the other taking place among libraries in NARS, IARCs, and so forth but the accent is on the development of formal networks with clearly defined responsibilities, roles, and agreements that would enable researchers in NARS and IARCs better and more predictable access to information than if each NARS or IARC acts on its own. Further, such networks could enhance the skills, capacities, and capabilities of NARS to handle information and manage it more effectively. Such networks would obviously need policy support of the senior management of the participating NARS and IARCs, the commitment of library and information professionals, and the financial support of donors to underwrite set-up and some operational costs until the NARS and IARCs can begin to sustain them.

Library and Information Networks in NARS

Pre-requisites for Networking – Several writers have spoken of pre-requisites for successful networking. Hailu, (1989) uses an adaptation of Plucknett and Smith's (1984) list of pre-requisites for research networks as being valid also for information networks. These are:

- The problem should be clearly

defined and an agenda for action to be drawn up.

- The problem should be widely shared among the potential participants.

- There should be evidence of strong self interest in participating in the network.

- Trained personnel should represent participating members and contribute to specific tasks and network coordination meetings.

- Strong leadership comprising of a steering committee and a full time coordinator. All participants must be involved in the decision making process affecting the activities of the network and be treated as equal partners.

Some of these pre-requisites may not always be met by libraries in NARS, such as presence of well trained personnel who would be in a position to contribute to specific tasks. The identification of such gaps in participating institutions and the alleviating of these would be very much part of network development work, or a pre-networking phase, and strategies may be suggested in the network project document to address such gaps.

Given the low status of the library and information professionals in many NARS, it is perhaps useful to add another pre-requisite to those listed above for successful NARS library networks, that is, the explicit commitment of the top managements of the different NARS institutions that librarians/documentalists would be provided the requisite policy, managerial, material and financial support to be able to effectively participate in the network. Commitment of librarians and information personnel alone is not enough since they are not decision makers within their NARS unlike their counterparts in research.

Another useful view of the desirable features for a successful network is that of Atherton (1977). These are:

- Organizational structure that provides for fiscal and legal responsibility, planning and policy formulation. This presumes that there is

commitment, operational agreement and common purpose among participants.

- Collaborative development of resources, e.g. union catalogs.

- Identification of nodes that provides for role specialization as well as for geographic configuration.

- Identification of primary patron groups and assignment of responsibility for information service to all within the network.

- Establishment of a communication system designed to carry the desired message/document load at each level.

- A central bibliographic record that provides for location of needed items within the network.

- Switching capability for interfacing with other networks.

- Guidelines for selection of what is to be placed on the network.

- Evaluation criteria and procedures to provide feedback from users and operators.

- Training programs for users and operators.

It can be seen that the two sets of pre-requisites, one from researchers and the other from an information scientist, have many common factors. Some of the desirable features in Atherton's list are obviously meant for the developed world and for use with modern computer-communication systems. Nevertheless, the general principles behind these two lists are worth remembering when planning networks.

Network Objectives – Needs will vary from region to region and therefore specific objectives of networks will also vary. However, the overriding reason for setting up library and information networks is to ensure the coordination of efforts and sharing of resources to better satisfy information needs of users in a subject area and/or geographic region of mutual concern to network members (Hailu, 1989).

Although this may be obvious, it is important to stress that the planning for a network must begin with a clearly defined and agreed set of

specific objectives. A typical set of objectives may be as follows:

- Every participant should have accurate information on the holdings of the other participants, and that this is kept updated in an on-going manner.

- Participants should agree on a minimum level of service to each other. Depending on the strengths and weaknesses of the different participants, there may be need for bilateral or multilateral agreements on shared services and norms.

- Participants should agree to act in a coordinated manner in acquiring information resources of common interest.

- Participants will cooperate in sharing their experiences and that training and development of personnel will be coordinated.

- Participants should use agreed standards in the description, processing, storage and communication of information.

The above list is by no means exhaustive but only illustrative of the kinds of goals or objectives that may be thought of in networking. Within each of the above mentioned goals, the participants, could be more specific in spelling out types of holdings, services, standards, and so forth that would be the focus of networking activities. For instance, participants may decide to give high priority to ensuring that a common database of serials holdings is built and kept up to date so that the sharing of such resources is better facilitated. Similarly, participants may decide to delineate the subject focus of networking, for example, information on specified crops which are important in the region.

Network Participation – The push for networking often comes from a center which is already very active. This is seen for instance in the research networks, many of which have come into being as projects of IARCs. This is understandable because such organizations accumulate experience that point to gaps which can be filled cost-effectively via networking. Sometimes there is a tendency to exclude organizations

that are not in a position to contribute to tasks identified as important. No organization *a priori* should be barred from participating in a network. Such a step is counter to the very purpose of networking. All potential organizations should be invited to participate in the network and the decision to participate or not, should be left to the individual organization. Even so, once a network is established and begins to produce useful products and services, all relevant organizations in the region, should receive information about the activities and achievements of the network.

It is important for the network also to decide what information resources of participating organizations will be shared. For instance, an agricultural university or college has to provide service to a large number of students and faculty, and therefore they may not be able to participate effectively in inter-lending of their publications to others in the network. On the other hand, they may be in a position to provide cataloging data to the network by virtue of their larger acquisitions program. Similarly, they may be in a position to provide expertise and facilities for training programs or on-the-job training of professionals from other network participants.

In planning the membership of a network, it is important to look carefully at the different kinds of users needing access to agricultural information, and to ensure that organizations in which such users work are also involved in the planning and development of the network. Thus in a Ministry of Agriculture, there may only be a small library serving essentially the policy, decision making, and regulatory personnel of the ministry. The network must examine how it can augment the resources and services of such a library and also how such a library can contribute its resources or expertise to the network.

Sharing of Resources – Database Development. Resource sharing is possible only if each participant has knowledge of the availability and holdings of resources with other participants. The creation and main-

tenance of databases describing the resources is an important activity of the network. Each of the participants in the network will need to be responsible for contributing information on their resources to a central or nodal member who would then ensure that all inputs are received and added to a database. Such a database would then be made accessible to others in the network using the best possible access mode. Responsibility for the creation and upkeep of different kinds of databases may be shared between members of the network.

The different kinds of databases that are possible to be developed in a library and information network are as follows: union catalog of serials holdings; union catalog of monographs including non-conventional literature; and union catalog of other types of materials, such as patents, and theses.

In addition to the above mentioned databases, there may be special resources existing in a participating library (such as information on a particular crop or disease). A database of information on such specialized resources may also be planned as a network resource although this may not be commonly accessible to all members. However, knowledge of the availability of such a database and responsibility to provide access to or services from such a database is an essential part of networking.

An important resource in many NARS libraries is their collections of locally generated information, such as reports, papers and so forth, produced by researchers, policy makers, ministries, consultants, donors, and extension departments. These documents contain valuable location-specific information and are not usually published. They constitute the bulk of the so-called non-conventional literature. Access to such information can be greatly improved if NARS libraries can build databases describing such literature. Such databases could be extremely useful to the local research staff in planning their research and in problem-solving or policy formulation. Such a

resource would be very valuable also to IARC scientists who are often starved of location-specific information. Given that in a region, there is a great deal of similarity in such as crops grown and problems faced, such databases if mutually accessible to other NARS in the region would contribute greatly to the sharing of research experience in the region. A network of NARS must carefully examine the potential of building a common database of such information for possible use by participants in the network. One example of such a network is RESADOC in West Africa.

There may be participants who have access to databases outside the network. Knowledge of such access to external resources is also part of networking.

In addition to the well known bibliographic databases mentioned above, there is potential for the development and sharing of information on on-going research in the different NARS. Such databases are similar to FAO's Current Agricultural Research Information System (CARIS) database. Such databases could in fact be created from the regions' input into CARIS.

Another important non-bibliographic source of information is statistical or time-series data on area under cultivation, production, yield, export, prices and so forth. Such data is often unpublished especially in small countries and accessible only in reports submitted to different departments of the government. Access to such data is vital for economists, statisticians, and policy makers not only within a NARS but also in international centers and in other NARS. A network should examine how and to what extent access to such data can be provided in the network.

Other databases that could be shared are of germplasm/herbarium collections, directories of subject specialists, and of specialized institutions, and specialized laboratory/testing facilities useful in agricultural research. Librarians have special skills to build not only bibliographic data-

bases but also non-bibliographic ones and therefore the potential for such databases being shared in a NARS library network is real although this may not have been achieved in practice.

The advent of CD-ROM has enabled NARS centers to subscribe to databases and other reference material on CD-ROM. Knowledge of the availability of such resources among network participants is an important part of networking. Also, responsibilities of providing services based on such resources needs to be addressed in networking.

Where several libraries in the network have interest in one or more CD-ROM products and where the telecommunications infrastructure allows it, it may be cost-effective to think of mounting the CD-ROM databases on a central server to be remotely accessible from sites in the participating NARS. The cost of subscribing to the CD-ROM products and the maintenance of the central system could be shared by the participants in the network.

Information and Document Delivery. The actual delivery of the full text of needed documents is another area of cooperation that is necessary to be addressed in a library and information network. In fact the end-user, judges the success or failure of the network by the efficiency with which it can deliver documents to him. In this area of networking as in others, there is need for well defined responsibilities and agreements between network participants. Fortunately photocopier technology is widely available in the developing world. Similarly, the use of telefacsimile machines is on the increase. However, the network plan will need to see how NARS libraries should be equipped to be able to respond quickly to document delivery requests from others in the network.

Since efficient document delivery is critical to the success of a network, there may be need to build linkages with other networks, information systems, or clearing houses as part of the network development plan with

the cost of such linkages being shared. One of the members may be given the responsibility to coordinate the acquisition of services from the chosen system or clearing house. It may be possible to identify a donor to help in establishing and using such a system, including underwriting costs of such use, with communication costs, photocopy or fax charges, for example, until such a time that this can be taken over by the members.

Resource Building. The value of a network for information professionals and end-users is determined by the range and quality of sharable resources, the speed of transactions for example, search of common databases, requests for photocopies), and the response time, such as the elapsed time between the request for a service and its fulfillment. A network may coordinate its efforts to maximize its access to primary and secondary information sources, and tools to handle such sources. For instance, participants may decide to take part in cooperative acquisition of serial publications based on the speed and ease with which such resources can be shared, and on the willingness of participants to make sacrifices for the common good of the network.

Human Resources Development and Sharing of Skills. Some of the most valuable resources in a network may be skills. Networking can facilitate the sharing of skills among participants through short-term consultancies, secondments, and training programs.

An important activity in networking may be human resources development. In some networks the first phase may be devoted primarily to the training of professionals and others in participating institutions as a foundation for future services. In subsequent phases, there may be the need for training in specific areas, such as the use of a software package. The network plan, based on an inventory of skills available and those needed, would indicate the kinds of training programs and their timings.

Information Technology in Library Networking

Computer-communications networks, such as those that allow remote access to computers and databases, enable data/file transfers between computers or a terminal and computer, and messaging between remote end-users, have played a significant role in library and information networking in the developed world. Most of these networks use leases or dial-up telephone lines and packet-switching technology. The speed and reliability of these networks has steadily increased over the years. The costs of data communications per unit of data transmitted has steadily fallen. The availability of library management software permitting local processing as well as access to remote host computers has enabled libraries to be linked together in distributed computing networks. Such systems provide many advantages in the sharing of cataloging data, rapid access to union catalogs, automated inter-library loan management, messaging, downloading of data from remote host computers and so forth. Client/Server technologies which are becoming available now will enable inter-networking and user-friendly access to a variety of information resources across networks and even continents. The availability of cooperatively produced cataloging and other bibliographic databases on utilities such as OCLC (Online Computer Library Center) is an added dimension of the capabilities of library networks in the west. Optical storage media (CD-ROM, WORM) and the possibility of providing remote access to these is yet another option that is being tried in networks, not only for reference databases but also for full text databases. The digitizing of text for transmission across networks, although experimental at present, has great potential for rapid document delivery.

The principal concern in developing country library networks has been to minimize costs of processing



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several thousands of books and other documents acquired by a library, participate in cooperative acquisitions programs to minimize avoidable duplication, and at the same time permit wider and easier access to informational material for library patrons than if each library acted on its own. In many developing countries, however, the objectives of networking is not to manage the plenty (by comparison) as in the developed countries but really to share the little that the institutions can acquire with their limited resources and access to foreign exchange.

Given these realities, the short-term technology options for most NARS library networks would be stand-alone microcomputers, local area networks based on microcomputers, CD-ROM, and low-end microcomputer-based, computer-mediated communications systems. It would be necessary for apex centers in the NARS or in a network to be equipped with bigger computers, and telecommunication links to allow access to external systems. It will be quite some time before libraries in NARS

centers in Asia and Africa can begin to use packet switching systems because of high costs and the lack of trained personnel to utilize such facilities.

The availability of microcomputers at affordable prices and free-of-charge, public-domain software, such as Micro CDS/ISIS, has undoubtedly been a boon to many small NARS libraries. Database development in a NARS library network could begin by agreeing on common standards for their bibliographic databases. Each library could then create its database on a stand-alone microcomputer which is contributed to a nodal center where it is consolidated and distributed to all members. Each member would have a copy of the total database, for example union catalog of serials. This would have to be kept up to date and each NARS member could take the responsibility to contribute to this task. Such a scenario is possible if each of the participating members is provided with a microcomputer and if the staff of such centers are given training in using the software and agreed standards for database development. Similarly, the building of specialized microcomputer-based databases from a global agricultural database such as AGRIS for use in an individual library or in a network is an option that can be explored by NARS. The development of capabilities to use CD-ROM products within individual NARS would have to be given very high priority, given that more and more products including full-text databases and multi-media products are becoming available on CD-ROM.

The importance of using internationally accepted standards for bibliographic description and structuring of NARS databases cannot be over-emphasized. Adherence to standards would enable NARS libraries to be compatible with other systems, enabling easier interchange of data and information for mutual benefit.

Another attractive option for NARS libraries is the use of low-end, microcomputer-based electronic mail systems that use existing voice grade

telephone lines. Examples of such networks are the Fidonet and Greenet networks using communications software such as Frontdoor and Procomm. These are relatively inexpensive to set up with one center acting as the Central System and others becoming nodal centers but in a position to communicate multilaterally via the central system.

Role of IARCs in NARS Library Networking

The information facilities of IARCs are quite conscious of the need to work more closely with the library and documentation centers in the NARS in the provision of and access to information in the different areas of specialization of the IARC's. In a meeting of information specialists of the IARCs and NARS held at ICRISAT Center (CGIAR, 1989) there was a strong recommendation that IARCs should explore with other international information centers and systems (for example, AGRIS), and NARS, the establishment of regional information networks that would build on existing resources and address the following issues:

- collaboration between and among IARCs, NARS, and regional agricultural information programs.
- strengthening links between the above mentioned three types of information programs and research networks.
- the human resources and infrastructure needs national agricultural information systems.

Subsequent to these recommendations, IARCs in Africa, West Asia and North Africa (WANA), and Latin America have taken initiatives to work in a more integrated manner with NARS libraries.

IARC information systems are already active in meeting needs of NARS researchers in areas/crops of IARCs mandates. IARC information facilities have the following comparative advantages:

- They are relatively well funded as compared to the NARS.
- Their staff are well trained and

possess excellent professional and technical skills.

- Most of them have access to new information technologies.

- Most of them already possess extensive resources in their areas of specialization.

- They are already linked to several external agricultural information systems and services.

- They utilize tried and tested tools for information handling.

- Their information products and services are useful to several NARS.

IARC information systems also have the following drawbacks. The narrow specialization and research focus of IARCs and hence also that of their information systems means that they alone cannot respond to the very broad information needs of NARS. Also, IARC budgets for information work are declining.

IARC information facilities could play the following roles in NARS library networks:

- A 'linkage' or mediating role. In this, IARCs could be the link between NARS and developments in the information world since IARCs, by virtue of their international character, are abreast of happenings that could be relevant to NARS. Some IARCs already perform a linkage role, for instance when they distribute and support software useful to NARS.

- A 'laboratory' role. In this role, IARCs could provide on-the-job exposure for professionals of NARS libraries in specific areas. Such exposure could have a beneficial effect on the confidence of NARS information personnel.

- A 'catalyst' role. In this, IARCs could provide a neutral forum to discuss issues together with backup resources and skills. Similarly, IARCs

can provide the technical or professional leadership in the development and standardization of tools useful to NARS information networks. It is possible also to think of joint projects of IARCs and NARS for improving capabilities for information handling in the NARS.

- A 'delivery' role. IARCs already provide delivery of services to NARS researchers. Integrated use of IARC databases and services with those of NARS would enable researchers quick and wide access to a broad spectrum of information.

- An 'advisory' role. Expertise and skills in IARCs could be used by NARS networks in better planning, organization and management of the network.

- An 'educational' role. The pool of trained information specialists in the IARCs could be used in training and education programs useful in the building of library and information networks in NARS.

Conclusion

Networking as a method of bringing together diverse units with varying needs, strengths, and weaknesses to serve a common goal has been successful in some places and has also not lived up to expectations in others. A key ingredient in successful networks has been a strong commitment of those responsible for the design, implementation, management and use of these networks. The onus of making NARS library networks successful lies squarely on the shoulders of NARS information specialists who can count on the support of IARCs and other actors in the agricultural information field.

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