THE CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

TECHNICAL ADVISORY COMMITTEE

Fifty-Sixth Meeting, IFPRI, Washington D.C. (USA), 22-26 October 1991

INFORMATION SERVICES IN THE CGIAR

(Agenda Item 11)

Objectives of the Discussion

In the TAC paper "A Possible Expansion of the CGIAR" (AGR/TAC:IAR/90/24) the provision of scientific information services to national institutions was considered an activity in which the CGIAR could continue to play an important role in the long term. This paper identifies key strategic and policy issues for TAC's consideration. It also discusses the future role of the CGIAR Centres in the development and use of a more coherent global information system for research and related activities.

TAC SECRETARIAT

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

October 1991

INFORMATION ACTIVITIES IN THE CGIAR:
STRATEGIC AND POLICY ISSUES

1.   INTRODUCTION

Advances in information technology offer unprecedented opportunities for increasing the pace and reducing the cost of conducting research. New ways of collecting, storing, manipulating, communicating and disseminating information have already begun to influence how researchers practise their profession. Advances in communication technology have opened new avenues for collaborative research, providing links among programmes that are scattered around the globe.

In this rapidly evolving use of information technology, the CGIAR supports only a relatively minute fraction of the total effort. Potentially, however, the importance of the CGIAR contribution far outweighs its size, through the catalytic role its institutions can play in stimulating the wider use of new information systems in the developing countries. But, to be effective in this role, the Centres must remain closely in touch with world developments, clarify their roles in relation to those of other actors on the global scene, and take steps to pursue coherent policies across all the CGIAR institutions.

This paper draws on a draft by Eleanor Frierson and Selcuk Ozgediz, an earlier version of which had been discussed by a group of Centre staff conveyed to discuss information topics. Comments were also received from the CGIAR Secretariat, TAC Secretariat, IDRC, and CAB International. The Standing Committee on External Reviews had requested an analysis of information issues in the context of its discussions on whether or not there was a case for mounting an inter-centre review of information services, bearing in mind that a recommendation to that effect had been made in a consultant's report commissioned by the CGIAR Secretariat (John E. Woolston, Scientific and Technical Information in the CG International Agricultural Research System, 1990).

Since the Woolston paper was published, information management has been discussed in a paper by Selguk Ozgediz, entitled: "Overview of Management in the CGIAR Centres", and future needs for information services have been discussed, more generally, in a TAC paper entitled: "A Possible Expansion of the CGIAR". At International Centres Week 1990, the CGIAR approved the long-term vision of the CGIAR presented in the expansion paper, and TAC is now working on priorities and strategies paper, which incorporates those ideas. In the meantime, the Standing Committee recommended, and TAC agreed, that a decision on an inter-centre review on information should be deferred until the issues had been clarified as part of the process of developing the priorities and strategies paper.

This paper is an input into that process. It discusses the future role of the Centres in the development and use of a more coherent global information system for research in agriculture, forestry and fisheries (abbreviated in this paper to: "the global information system"). The primary purpose of the paper is to identify key strategic issues.

2. BACKGROUND

In the Woolston paper and in reports of the external reviews of some Centres, information activities are identified as including computer systems and services, library and documentation systems and services, communications and publications, and records management and archives. Sometimes public awareness is considered to be an information function and sometimes not, depending on whether it is seen as the role of an information group or of senior management.

Because computer systems and services are closely linked to scientific activities on the one hand and to management activities on the other, the information function permeates the totality of Centre activities, as it does in any modern research institute. There are differences, however, between the information function in a CGIAR Centre and the same function in a typical national research institute, whether in a developed or developing country.

In any research institution, information is required as a key input into its activities (as data, methods, techniques etc), but it is also an output of those activities (as published results of experiments, annual reports etc). The CGIAR Centres have a requirement for information inputs similar to those of the majority of research institutes. They differ from this norm, however, in several respects. They have a much more important information output function, because they exist to serve the developing countries in research and training. They have a commitment to assist them in strengthening their own capabilities, and they also have a truly international role in helping to bring national research programmes more closely together to promote collective activities, including the free interchange of knowledge, information and genetic resources.

As stated in the TAC expansion paper:

> "With the information explosion and the rapid development of multimedia communication techniques, the need for international mechanisms of collection, evaluation and dissemination of research findings will increase. Improved mechanisms to facilitate international exchange of results, ideas, methods and personnel will be critical... The major issue to be recognized is that these activities too have great economies of scale and significant spillover. These are truly international public goods which will be underproduced if left only to individual nations."

Although TAC, in the expansion paper, expresses its opinion that there will be a significant information role for the CGIAR in the long term, until now the System has not come to grips with how information services should fit into CGIAR priorities and strategies. The Woolston and Ozgediz papers describe considerable variation in mandates, resources, and effectiveness of information functions. Most external reviews have treated information in a somewhat cursory fashion and, as noted by Woolston, a recognizable body of doctrine and style has evolved within the CGIAR concerning Centre research and training, but not with respect to information.

Centre expenditures for information programmes have increased over the last decade. TAC and the Centres are grappling with difficult decisions on the priorities to be assigned to information activities, complicated by the fact that there is no common understanding of what information activities are appropriate for the Centres or what might, more appropriately, be performed by other actors on the international scene.

A shared understanding of information functions and a common vocabulary would help to define strategies and policies and would not necessarily lead to what Woolston calls "mindless uniformity" among Centre programmes. Within their mandates, Centres must implement their programmes as they see best. Nonetheless, there are areas where collaboration among Centres and other organizations, and the development of common standards, would be productive. As TAC has already noted, new information technology facilitates great economies of scale without sacrificing quality or autonomy.

One major source of confusion about information services in the CGIAR is a lack of understanding about how Centre programmes complement or supplement those of other actors. The roles of other actors in the different functional areas of information need to be understood before judgments can be made about the possibilities for adjusting responsibilities among Centres, strengthening collaboration among the various institutions involved, or relying on institutions outside the CGIAR for certain aspects of the work.

2.1.   Other Institutions Involved in International Information
          Activities

There are many institutions besides CGIAR Centres that provide information services in areas related to research in agriculture, forestry and fisheries. They produce or provide computer services and equipment, publish in the printed and electronic forms, and provide a range of other services, such as library, documentation and abstract services. In order to avoid both duplication and gaps in programmes, the CGIAR Centres and these other institutions need to know more about each other and to develop mutually beneficial relationships.

One example of the need to clarify the roles of different actors comes from the library and documentation community. Currently, in addition to the CGIAR centres, universities, and other institutions active in this area, there are three frequently mentioned producers of bibliographic databases. Two of these are international organizations, namely FAO and CAB International (CABI), and the third emanates from the USA National Agricultural Library (NAL). FAO manages and coordinates production of the AGRIS database; CABI produces the CAB Abstracts database; and NAL produces the AGRICOLA database.

Their respective roles in this area do not seem to be widely understood and there has been speculation that one or all of them could provide services now provided by the CGIAR Centres. However, closer examination of the respective roles of the Centres and these other organizations in this one area of information services (library and documentation) indicates that the extent of the overlap into serious. It

also illustrates the need for formulating clear policies within the CGIAR over the whole range of information activities.

2.1.1. CGIAR Centre library and documentation programmes

Some CGIAR Centres have developed large, specialized databases in subject areas directly related to their mandates, which describe documents they have identified and collected. The databases generally include abstracts, some in multiple languages. Most centres provide information from these databases, and copies of references, free of charge, to developing-country researchers. Some charge for services. The databases aim to satisfy the specialized needs of each Centre's, clientele, which include Centre staff and external clients. IDRC has played a very useful role by funding the establishment of many of these programmes.

2.1.2. FAO and AGRIS

Records for FAO's AGRIS database are produced in a decentralized fashion. AGRIS input centres are designated by national authorities for countries that participate in AGRIS. In addition, international organizations, such as many CGIAR Centres, are also AGRIS input centres. All AGRIS input centres acquire rights to the entire database through their participation in its creation.

AGRIS aims for comprehensive coverage in agriculture and forestry, but the level of coverage depends on the resources, available to AGRIS input centres within their institutions or countries. NAL has historically provided the largest percentage of AGRIS records. FAO does not provide a document delivery service. Instead, researchers who want copies of a particular item are directed to the institution that contributed the relevant bibliographic record. If that institution owns the document, it might provide a copy to the requester, sometimes for a fee.

FAO has also promoted participation in AGLINET, an international network of libraries that agree to lend items to one another at low or no cost to the ultimate client. Some CGIAR Centres and NAL belong to AGLINET. FAO has also worked with the Centres to provide specialized journals in certain fields.

2.1.3. CAB International

CABI is an international organization with its member countries drawn form both the developed and developing world. Originally confined to countries of the British Commonwealth, it became a global organization in 1985. Like the CGIAR Centres, CABI has significant scientific capacity (in biosystematics and biocontrol) which adds to the relevance of its information services. CAB ABSTRACTS, the most important of CABI's information products, covers agriculture, forestry and various allied disciplines, including aspects of biotechnology, human diseases and nutrition, applied social sciences, and environmental science.

The database comprises full abstracts of selected scientific material, not just titles and bibliographic details. In being selective in its abstracting, CABI aims at removing from its clientele some of the burden of sifting through an unmanageable volume of literature. The database has generally avoided "grey literature", extension literature, and training material, but its policy on coverage is currently under review. CABI can provide copies of most of the items abstracted, which it does either itself or through cooperation with other organizations.

CABI has been forced to charge for most of its document-delivery and library services. Such charges are necessary because CABI's information service aims not only to recover its costs, but also to contribute to the financing of the CABI scientific programmes, especially those that support its global services in the identification of parasites, micro-organisms and arthropods. In many respects, the CGIAR Centres and CABI aim to achieve similar goals in the information area. There is already a good working relationship between them in this area of information activity, as CABI has been working with many of the Centres to produce specialized abstract journals.

2.1.4. The USA National Agricultural Library (NAL)

NAL prepares records for its AGRICOLA database to describe items held in its collection. NAL aims to be the world's largest and most comprehensive library of print and non-print material connected with agriculture. It collects material of all sorts in a wide variety of subject areas. NAL has actively sought out CGIAR Centre publications for its collection and describes them in AGRICOLA.

As one of the three national USA libraries, NAL is federally funded; its most important clientele is the USA agricultural community. NAL is required by government regulation to provide information freely and at the lowest possible cost, while at the same time recovering some of its costs. This means that although NAL can and does provide delivery of the documents described in AGRICOLA, it must charge for these services. AGRICOLA includes abstracts where possible.

2.2. Duplication and its Avoidance

These examples indicate that although each organization has a somewhat different orientation, there might well be undesirable duplication of products between the CGIAR Centres and these organizations, unless steps were taken to avoid it. Superficially, it might appear that all these programmes were highly duplicative. In fact, considerable effort by all concerned has been made to ensure that duplication is kept to a minimum.

Whenever possible, CGIAR Centres purchase or acquire AGRIS, CAB Abstracts, and AGRICOLA for their own use. However, there is always a core of material in Centre collections, up to 65% in some cases, that is Centre-specific and not represented in the AGRIS, CAB Abstracts, and AGRICOLA databases. Even when items are listed in the three databases, and might theoretically be available from outside sources, Centre research staff need immediate access to important material. Centre staff have been meticulous about working with FAO, CABI, and NAL to ensure the maximum

level of cooperation and collaboration without prejudicing the need for material and services to be available locally. Nonetheless, the issue of duplication and its avoidance is one to which the Centres must remain constantly alert.

There are similar opportunities for overlap in the areas of publishing, computer services, and communications. The Centres need to be constantly vigilant to avoid unnecessary duplication in all aspects of their information services. They also need to continue their efforts to collaborate with each other and with organizations outside the CGIAR System in order to maximize the benefits of complementary capabilities.

The examples outlined above also illustrate differences in the ways in which the various organizations either recover the costs of production of their information products, or take steps to avoid them (as with AGRIS, for example). The resulting differences in pricing have implications for the attractiveness of the various products to developing countries, as well as for the ways in which donor funding might be used to affect the success of products competing in the same markets. Such considerations call for pricing policies and ways of using donor funding by one organization that are not prejudicial to the long-term competitiveness of desirable information products of another. This, in turn calls for close understanding and recognized responsibilities among the various organizations involved.

3.   A VISION OF THE FUTURE

CGIAR strategies in the general area of information must be related to a clear vision of anticipated future needs. In its expansion paper, TAC suggests that in the long term the CGIAR would function more as an international service institution than at present. Of the three areas of service outlined, the third is information:

> "There may continue to be a need for an international focal
> point to provide wide-ranging information services to
> institutions and individuals worldwide. Such a mechanism might
> maintain and update data banks on insects, pests, diseases,
> etc., provide abstracting and literature search services,
> catalogue current and completed major research projects and
> programmes, and generally facilitate linkages between
> institutions by helping match the supply of researchers and
> research institutions to specific manpower demands from a
> variety of clients from developed and developing countries.
>
> The above is not to suggest that the CGIAR would be the only
> and lead player in the International scene. Quite the
> contrary. The proposition is that these activities are
> critical to the CGIAR accomplishing its goals. The CGIAR could
> be the lead mechanism in some, an active partner in others,
> only a financial contributor in still others, and an advocate
> in the remainder. TAC does not propose a specific model or a
> clearly defined role. For a time horizon of 30 - 40 years such
> precision would be too speculative an activity, but TAC does
> suggest strongly that these activities will be long-standing
> candidates for international support".

An important aspect of achieving the CGIAR goal is to foster the development and use of a coherent global information system. As the TAC vision of the future acknowledges, however, the CGIAR is but one actor on this global stage. The Centres, along with countless other organizations will continue both to use the global information system and to contribute to it. They also have an obligation to assist in strengthening the capabilities of developing countries to do likewise.

Another aspect of TAC's vision of the future foresees the evolution of a division of responsibilities between ecoregional activities and global commodity activities. Those Centres that develop ecoregional activities will have wider operational mandates than has been customary for Centres in the past. They will achieve this broader approach mainly through collaboration with national programmes and by acting as host for other Centres within the System, as well as for organizations outside it. Among these extended collaborative arrangements, there would clearly be a place for specialist organizations in the information field, so that the Centres involved in ecoregional activities would not become drawn into consultancy or training activities in those areas of information management or technology for which they have no specialized competence.

4.   STRATEGIC ISSUES

From the discussion so far, it is clear that there are several important strategic issues that need to be carefully considered by the CGIAR community. These include:

-    What should be the long-term role of the CGIAR in relation to other organizations in the information area?

-    What should be the role of the Centres in strengthening national capabilities?

-    What considerations should determine strategies at the Centre and inter-centre levels?

4.1.   The Long-term Role of the CGIAR

In TAC's long-term view of global information needs (quoted above), the concept of a "focal point" needs to be developed in consultation with the other leading actors on the global scene. It could include the possibility, for example, that some global information services would be provided through an intellectually and technologically coherent network of physically decentralized sources. Already telecommunications and data storage technology allow networking of large and small computer installations and facilitate rapid provision of information from many sources to clients who are unaware that responses are not coming from one source.

A good example is provided by financial services networks. When a bank customer uses a money machine card to request cash, the appropriate transactions are routed through a number of computers in a banking network before a response appears on the money machine in seconds. In a similar fashion, a researcher could inquire about information from any

number of global information service points and receive a response from one or several information sources located around the world.

Consequently, to clarify and develop TAC's long-term vision, it would be important to avoid limiting the concept of a focal point to that of a physically centralized mechanism. It is also desirable to clarify how, in the information area, the Centres should be linked to each other and to organizations outside the CGIAR. Presumably, Centre contributions to a more coherent global information system would continue to be built around the things they do best and which are not done by others.

In general, this principle would imply that their information products should be confined to the subjects defined in their operational mandates and be closely tailored to the needs of their clients. They should nevertheless be made widely accessible by ensuring that they are cited in major databases and covered by international information services. It would help to avoid undesirable duplication, however, if agreement could be reached at an early stage on a realistic division of responsibilities, both among the CGIAR Centres and between them and other organizations on the international scene.

4.2. The role of the CGIAR in Strengthening National Capabilities

Although there is no single formula for strengthening national research systems in developing countries, three important pillars needed to support a strong national system are having good researchers, adequate research facilities and a critical minimum capacity to acquire and manage information. While investment in information management alone is no substitute for the other components, it could serve as a catalyst for improvements in them as well.

TAC's view of long-term information needs should not be construed as a purely passive function, with the various organizations simply maintaining repositories of data and information. On the contrary, although it is called a global information "service," the activity implies aiming towards the design and implementation of outreach programmes following careful analyses of client needs.

Advances in information technology offer new opportunities for the Centres and other organizations to work with national research systems, to support research networks, to transfer data and information, and to begin a process of collaborative and decentralized creation and maintenance of information services and products. While the development of data systems is never inexpensive, there has been an unprecedented rate of reduction in the cost of using the products of information technology. This means that carefully designed information services can be shared and disseminated at relatively low cost.

However, the Centres' commitment to assisting developing countries to build their own capabilities is a role that is shared with other organizations, making it desirable to analyze and exploit the benefits of the interrelationships among them. Given the goodwill of all concerned, it could lead to a more productive division of responsibilities and more efficient use of available resources. Such an analysis would be dependent on having adequate information on the needs of national research

systems and the roles that various actors could play in meeting those needs.

Under the TAC vision of the evolution of global and ecoregional responsibilities within the CGIAR System, ISNAR could take a lead role in promoting the development of strong national capabilities in information management; IBPGR could play a lead role in promoting consistent documentation practices for the conservation and use of plant genetic resources; those Centres involved in global commodity activities could be the focal points for information on their mandated crops; while those with eco-regional responsibilities would have a strong coordinating role in relationships between international institutions and national programmes. In this evolutionary process, however, the details will have to be worked out as the future unfolds.

In addition to the CGIAR Centres in general, and ISNAR in particular, several donor agencies, as well as other international and regional organizations, support programmes for strengthening national research systems in the developing countries. These programmes invariably involve information management as a component. Other programmes are aimed at strengthening information systems and their management, more specifically.

For example, among the donor agencies that contribute to the CGIAR, IDRC is currently working on strengthening the information function in national research systems. Others, such as USAID, are also becoming more actively interested, although they may not yet have any clear policies or priorities.

Among international bodies, FAO has a major interest in working with developing countries to strengthen their capabilities in information management, while CTA, funded by the European Community, has also been active in this area for some time. Meanwhile, CABI has greatly increased its emphasis on development activities. It is undertaking a series of "country assessment studies" to assess developing-country requirements for information products and services, as well as their training needs. It is increasingly becoming involved in projects to assist developing countries in the design of their information systems, and mounting in-country training courses on information management.

From these few examples, it is clear that there are several organizations that share the common goal of strengthening the capabilities of national research systems in information management. It is also apparent that there would be advantages, not only in sharing knowledge of developing-country needs, but also in working collaboratively to meet those needs in the most cost-effective manner.

4.3.   Strategies at the Centre and Inter-centre Levels

4.3.1. Some guiding principles

To promote effective use of resources in information activities, the Centres could explicitly encourage, through their training and information programmes, the use of existing data, information, and information systems, especially when these are readily accessible.

Similarly, they could discourage the "not invented here" syndrome of trusting only products developed locally. Because there are competing players in the information field, the Centres must, however, be careful to be objective in acquiring, using, and promoting products developed by others.

A guiding principle in developing CGIAR information products and services must be their responsiveness to client needs. Increased partnership arrangements with national and regional research institutions and other partners in the information field should help to define those needs, and Centres should eliminate products that are no longer in demand. As national systems become stronger and encompass more activities, Centres might wish to transfer groups of their clients to new national or regional services. There are already more demands for information services that can be met, and Centres would be wise to identify areas where others can handle a job better. The CGIAR should explicitly support the idea of client needs analysis and market studies as regular parts of the Centres' work in information programmes.

Another principle that could be adopted is that Centre research staff should not be unduly inconvenienced in their access to information in the name of economies of scale. For example, it is all well and good to promote cooperative development of library collections and their related information services in order to avoid duplicate purchases; but it is also important that a core collection of data and published material should be immediately available to Centre staff. If information technology has not advanced to the point where immediate access from remote locations is possible or cost-effective, a certain amount of replication is required. To provide specific guidance in this area, the Centres, with expert help from the outside, might wish to develop standards for information services for their staff, similar to those used by accreditation teams in their visits to universities and hospitals in the USA.

4.3.2. Quality standards

The credibility of Centres among their clients depends heavily on the maintenance of high standards of quality on all their work. Many Centres make provision for some or all of their publications to be vetted by a publications committee. Even so, criticisms are not infrequently heard among the international scientific community of a lack of rigour in some Centre publications, especially with respect to the presentation of data, their statistical analysis, and the objectivity of inferences drawn from them.

Centre publications provide a very useful vehicle for publishing, in a readily accessible form, results of Centre work and of work by national research systems that, for one reason or another, would be difficult to publish in one of the refereed international journals, or would be less accessible in that form. Nonetheless, it is vital that, in fulfilling this important role, the Centres do not unwittingly provide easy publication of second-rate material. This is a topic on which occasional exchange of ideas and problems among the Centres might help in sustaining the high standards to which all Centres aspire.

4.3.3. Technical standards

If the CGIAR is to play its part in achieving a continuous flow of information among global, regional, national, and other key actors, barriers to this flow must be removed. Inconsistent data cannot fit into multiple systems, nor should inconsistent systems be developed for the same task. How should standards be developed?

The Centres should be encouraged to place high priority on examining inconsistencies among the information systems they use. The Centre information officers, who have met several times during the past few years,have recognized the importance of this, but no concrete steps have yet been taken to improve the situation.

Likewise, databases for genetic resources have evolved largely independently of each other. The concept of genetic resources networks currently being promoted by IBPGR must be considered an important step forward, and every opportunity should be taken to interest these networks in standardizing their databases. The Centres involved in genetic resources should be at the forefront of these activities.

The need for having some common standards has also become more apparent during the production of the Compact International Agricultural Research Library (CIARL), which includes full text and images of about 2,000 Centre publications in the CD-ROM format. Not having the Centre publications in electronic format led to incurring high costs in converting paper products into electronic form. Standardization will in the future lead to major savings in producing CGIAR-wide products like the CIARL.

4.3.4. Staffing

The Woolston and Ozgediz papers describe quite inconsistent staffing patterns in Centre information management and services. While a certain amount of variety among Centres is normal, more consistency would contribute to the development of a shared vision and common guiding values that are needed in the information area. To achieve more consistency, however, implies the existence of stronger mechanisms for inter-centre planning that are in place at present. This issue is part of the broader issue of how to plan, fund and execute coherent programmes that involve several centres across the CGIAR System. Its resolution must form part of future strategic planning.

4.3.5. Funding of information services

The funding and recovery of costs for information services are controversial issues with implications, as already noted, for the competitiveness of the products and services of organizations outside the CGIAR. Some Centres already charge for information services and, in some cases, use revenue to support their information operations. Other Centres provide information services entirely free of charge.

There have been several attempts by Centre information staff to discuss this issue at inter-centre meetings and no consensus has emerged. It merits re-examination, especially in the light of the increasing

scarcity of funds for international research. It might well be an appropriate additional topic for discussion at the proposed global conference.

4.3.6. Centres as information trustees

In his report as a consultant, John Woolston waxes eloquent on Centres' responsibilities for both the information they create and that created by the national and regional programmes with which they collaborate. Unfortunately, the management of records and archives is very variable among Centres. In some, it is in a dismal state, largely because these are seen as housekeeping activities of low priority. There is a need for clarification of Centre priorities in these areas and for external reviews to be more penetrating in their evaluation of records and archives.

4.4.   Mechanisms for Resolving the Issues

The issues outlined above have implications both for the CGIAR Centres and for their modes of collaboration with other organizations Within the CGIAR System, progress on these issues can continue to be made by interaction among Centre information specialists the Centre directors and TAC. Several of the most important issues, however, cannot be resolved within the CGIAR System, but must take fully into account the current capabilities of the other actors as well as their aspirations for the future.

For this purpose, an additional mechanism is required. It should lay the broad foundations on which future action could be built, and should provide a continuing means for closer collaboration among all the organizations involved. As a starting point, the CGIAR might wish to sponsor, or co-sponsor, a global conference to assess needs and opportunities in the area of information services and their management, as well as to identify gaps and complementary capabilities.

5.   CONCLUSIONS

The individual CGIAR institutions and the System as a whole need to take full advantage of the opportunities offered by the information revolution. Not only do individual Centres need to adjust their internal information management systems to take full account of advances in technology, but the Centres need to examine collectively their respective systems to ensure appropriate inter-centre "coupling" and information compatibility. As part of the same process, they also need to examine how their systems could be coupled to those of national institutions in the developing countries, as well as to those of other actors on the international scene.

In the long term, the national research systems in today's developing countries should be able to participate in the global research effort as fully-fledged actors. To be able to play such a role, they need to narrow the widening gap in information technology between themselves and their partners in international research. In the short and medium terms, the Centres have an obligation to collaborate with others in assisting the

national systems to build or upgrade their information management capacities.

Furthermore, in the long term, emerging information and communication technology will enable various components of the global agricultural research community to be linked to each other more closely than at present. As the demand for new information products and services increases, cost-effective solutions to meeting these needs will be sought. Whether under the CGIAR umbrella or not, there will probably be a need for an international mechanism for co-ordinating global needs for information products and services, using decentralized nodes around the globe.

Integration of technological advances and exploiting complementarity of efforts in the information area will become increasingly important as the CGIAR moves into the future. Short-term and medium-term strategies should be developed with these principles in mind. Also, barriers to integration and complementarity, such as the lack of a commonly shared understanding of information functions and a common vocabulary, should be removed by taking appropriate steps to overcome them.

The CGIAR should take the lead in organizing a conference on global information needs and opportunities. Its purpose would be to review the needs of developing countries, identify where further studies would be desirable, assess opportunities for contributing to those needs, clarify issues, and explore ways of fostering collaboration among the major actors.