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Improving Productivity Through Research Collaboration

IMPROVING PRODUCTIVITY

THROUGH RESEARCH COLLABORATION

by

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There is general recognition of the need for developing countries to increase their research capability if they are to make continued progress. Evidence of this is perhaps most dramatically illustrated in the agricultural sector where projections of supply and demand in this decade indicate most developing countries need to increase yield levels by higher rates of growth than have ever been achieved before on a sustained basis.

Fortunately there is evidence that developing countries are responding by increasing resources devoted to research.* Some countries have made substantial progress in establishing a strong national research capacity. This is essential since studies indicate that developing countries need to develop their own research capability before they can effectively draw upon and utilize external research. However, the population and total resource base of many developing countries is too small to justify or allow sufficient resources to be devoted to mounting comprehensive research programs in all the different sectors and problems of these countries. Nearly 50 developing countries

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*See Resource Allocation to Agricultural Research (Daniels and Nestel eds.) IDRC 182e, 1981.

have a population of less than one million and almost twice that number have a population of less than five million people. Even if research and development expenditures could reach the industrial countries levels of up to 2%, total research resources in many of these countries are going to be concentrated in only a few areas or very thinly dispersed over a wider area. This situation is even more acute for the many individual research institutions which lack the human and financial resources necessary to undertake all of the research required by their country in any one area. Clearly a strong case can be made that the research resources of a wider community of scientists than can be found in any one institution and national program must be harnessed and efficiently coordinated.

Fortunately this has been happening and more cross-country collaborative research is being developed. The increasing number of regional or international research centres are playing a key role in promoting this collaboration. The most advanced and organized area is in agricultural research where, in addition to a number of regional research centres, a multi-donor consortium entitled the Consultative Group on International Agricultural Research (CGIAR) is providing in excess of $150 million to 12 international agricultural research centres and programs in 1981. However the existence of a regional or international centre is not essential in developing collaborative research programs and the International Development Research Centre (IDRC) has supported a number of networks which link only national research centres.

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This paper will outline some of IDRC's activities and experience in supporting networks of scientists working on common problems.

The IDRC was established in 1970 by the Parliament of Canada as an autonomous public corporation to stimulate and support research for the benefit of developing countries. An international Board of Governors is responsible for approving grants primarily to scientists in developing countries. It had committed $213 million in support of 1236 research projects by December 1981.

It is estimated that more than 40% of IDRC funds have been used to increase cooperation and coordination of research by building research networks between developing countries both within regions and globally. While IDRC is prepared to support individual research projects involving only one research institution, it feels there are significant advantages in encouraging greater collaboration in research activities between institutions and countries in developing regions. A number of reasons for IDRC's encouragement of collaborative research can be identified.

Scientists in developing countries often work in small research institutions with limited library facilities or opportunities to travel and exchange ideas with other scientists in their own field of interest. The main external contacts of these scientists has often been with scientists in the industrial countries where they received their post-graduate training rather than with their peers in other

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developing countries who are working on similar problems and facing similar constraints. Greater interaction with their developing countries colleagues is needed to evolve new methodologies appropriate for a third world environment rather than the models and approaches developed in the industrial countries. Providing opportunities for more collaboration between developing country scientists allows for peer training from scientists at different levels of development. It provides credibility and confidence to the work of the often isolated individual scientist working in any one institution. Individual institutions and even countries often lack a critical mass of expertise in any one field to be able to devote sufficient resources to ensure positive research achievements within a reasonable time frame.

While there are many advantages to promoting more collaborative research, there does not appear to be any one model which is appropriate in different fields and IDRC has been very flexible in the types of networks it has supported. As networks are developed and defined by scientists from many different disciplines, sectors and regions, each network has its own unique features.

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In a recent study carried out on IDRC-supported networks, the authors defined a network very broadly as an interconnected or interrelated system.* Twelve networks exhibiting a wide diversity in structure were examined (see Table I). However there are certain characteristics which are common to most networks and evidence that some guidelines for developing an effective research network can be developed.

The size of research networks supported by IDRC range from small single projects closely linking several institutions to larger, usually more informally, linked networks with more than 50 research projects. One smaller network is a project in Asia linking eight research institutions with a total contribution by IDRC of approximately $200,000 with the recipient institutions providing probably an equivalent amount in terms of facilities and salary and wages. The largest network supported by the Centre has involved more than 60 projects on cassava research, ranging in cost from under $5,000 to over one million developed over a 10 year period. IDRC support exceeded $7 million and the research institutions involved provided probably at least as much from their own resources.

Research networks supported by IDRC appear to fall mainly into two broad types. The first type is a "horizontal" network in which a number of researchers from different countries work within one project

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*Much of the analysis and comments in the rest of this paper are drawn from this inhouse study carried out by B. Nestel, J. Hanchanlash and H. Tono.

on the same problem, sometimes within one project or on a number of separate but similar projects. Usually the different research teams have a similar disciplinary composition, and similar or identical research objectives and methodology. An example would be a number of research projects all examining urban transportation or sites and services housing programs in different cities.

A second type could be called a "vertical" network involving a number of quite separate projects in different countries, all of which are working on different aspects of a common subject such as development of a specific crop.

The type of network chosen appears to be strongly influenced by the field of research and the size of the research resources available in each field or sector. Thus there is usually a large and diversified pool of agricultural scientists working within most countries and a well established system of regional and international agricultural research centres which can provide linking services. These scientists tend to evolve vertically integrated networks with research teams working on different aspects of one crop such as the breeding, entomological or agronomic requirements of one crop.

In contrast, social science researchers have usually been linked in a horizontal network. To some extent this is due to the limited number of scientists in one institution who could address any one

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issue in depth; to the location specific nature of the social science research and the need to carry out comparative case studies to determine causative variables.

Defining Network Research Programs

Different methods have been used to develop networks. Some networks have developed by an evolutionary process in which research institutions develop independent projects which build on or relate to research projects in other institutions. Exchange of ideas is facilitated through workshops, travel or publications until there is a close working relationship between research institutions in the same field.

IDRC has also frequently used a more formal approach in which it has invited institutions interested in a common research issue to an initial planning meeting which is called a project identification meeting. This frequently involves the participants beginning by identifying research priorities in a field before specific projects are discussed. In this case, the participants are usually directors of research who have the breadth of experience and responsibility for identifying or at least reflecting national research priorities. If it is a new area of research or is likely to involve comparative research, a second meeting may be held to define a common methodology before any research work begins.

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Coordinating Research Networks

The most critically important feature of a network, and the area where most problems are encountered, centres on the coordination of research carried out in different locations and institutions. It is also an expensive activity with coordination costs absorbing as much as 40% of the cost of IDRC's contribution. Assuming IDRC's share of research networks it has supported is approximately half of the total costs, coordination can still represent up to a fifth of all research costs.

One mechanism used to provide overall guidance and monitoring of network research is an Advisory Committee which usually consists of one representative from each participating research institution. In some cases, it has proven useful to invite distinguished scientists not associated with the projects to participate as disinterested resource persons. Normally these committees meet only once a year to review research progress in each institution and to suggest modifications where necessary.

While an advisory or review committee may be useful in providing a periodic overview by the participating institutions, my experience is that the most critical factor, especially in larger networks, is some means of regular contact with all network participants by a coordinator. As stated earlier, this is both a time-consuming and

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expensive component of a network but the essence of a network is some form of ongoing collaboration. It appears this can only be done effectively by regular visits to all network institutions where a coordinator spends time going over the research and administrative aspects of each project and becomes thoroughly familiar with the overall research program. The coordinator is then in a good position to identify and set up exchanges of scientists, arrange training courses and set up meetings.

The person chosen as a network coordinator may work on a full or part time basis and should be an experienced scientist respected by the participating institutions. In some IDRC networks a coordinator has been hired on a contract basis. However, it is probably preferrable to select a permanent staff member of one of the participating institutions as this can be a valuable learning experience for the individual and develops the personal contacts between scientists so important to ongoing collaboration. This can lead to complications if the individual is not generally respected or does not give equal attention to all institutions. The selection, terms of reference and briefing of the coordinator is probably the single most important element in creating a viable network. The coordinator must be prepared to work hard to win the respect and confidence of national scientists, to be able to push and guide research teams to improve their performance and to undertake a good deal of administrative work such as circulating material, preparing meetings.

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Common Research Linking Mechanisms

IDRC-supported networks have used a large number of linking mechanisms including exchange of scientists, study tours, joint training programs, publications and advisory committee meetings or workshops to present or disseminate research results. It is difficult to be able to assess which linking mechanisms are most effective but our experience indicates some are more effective. Exchanging scientists or promoting study tours of scientists to other institutions has generally been considered very worthwhile by those involved, particularly if the scientist comes from a weaker institution. One advantage of such exchange is that visiting scientists can see how much worthwile research can be carried out without the complex equipment and facilities they may have seen in the industrial countries and feel they need.

One advantage that networks clearly have over individual projects is that they bring together enough scientists in one field to justify setting up special training courses. The personal contacts established during these courses and the kind of practical research skills that these courses often emphasize results in group training having a very high return in the opinion of many network participants.

Consultants may be useful in drawing on additional expertise. If consultants are used, we've found that they can be much more effective if one consultant can be used to advise a number of projects or the

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same person is sent back to these projects if subsequent visits are needed. This allows both the consultant and the project teams to become familiar with each other and the consultant can also perform a network linking role. This linking effect can be strengthened if the consultant is drawn from one of the participating institutions.

One difficulty faced by many research institutions is the lack of adequate library and documentation services. Research institutions may not even exchange or have access to the publications of similar institutuions in the same country or region. A formally established research network can alleviate some of this problem by exchanging all publications or by drawing on one central documentation centre. The IDRC has supported the development of 11 specialized information centres (SIC's) which circulate abstracts of new publications, xerox articles for circulation. These SIC's are usually narrowly focused on one commodity or subject such as cassava or ferrocement. However it is difficult to establish such an information service unless there is an international or regional centre which has both the resources and mandate to service a number of individual countries. Thus the SIC's IDRC has supported have been located at "centres of excellence" such as the international agricultural research centres.

An important feature of most research networks is to promote exchange of research findings and most IDRC-supported networks use frequent workshops and workshop publications as a means of exchanging information. These workshops tend to be small working meetings of

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15 to 30 people in which all participants contribute by preparing papers, chairing a session or acting as discussion opener or rapporteur. These workshops are sometimes little more than an annual meeting of network leaders at which project progress and research findings are discussed. They may however present research papers or State-of-the-Art reviews which are then published.

Some workshops draw in policy-making individuals or publications are specifically tailored to inform policy-makers of research results which should be incorporated in development programs. Publications often have a large print-run of over 3000 copies and every effort is made to circulate them widely. The existence of a network provides greater assurance that publications get circulated to appropriate individuals but, even with a network, the distribution of publications with large print-runs may still miss many of the most appropriate recipients. The dissemination of scientific publications is an area which requires considerably more study.

As stated earlier, none of the network types or linking mechanisms used appears to have any inherent advantages over all others. However interviews with IDRC program staff and project leaders in networks did suggest certain recurring difficulties. Global research networks linked the largest number of researchers in a common field but sometimes encountered difficulties of coordination, greater travel costs and sometimes very different objectives and research environments. There is a greater

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liklihood that one region will dominate or be much further advanced in the quality or sophistication of its research. As a result, regional networks which involve fewer differences in environment and level of research capability may be more effective particularly in the social sciences. Networks which gradually evolve as more institutions begin to collaborate allow a network to build slowly and only add institutions when they're prepared to contribute. It does create a danger however that the different research activities will not complement each other as effectively as they could if there was joint planning of research projects.

Horizontal networks in which research participants define a common methodology to facilitate comparability of results can require a lot of time to develop this methodology. If the different participants try to produce a comprehensive report, the delays in completing one section can slow down the work of all participants.

In some cases, networks were designed to have a limited life and formal collaboration was dissolved after a study was completed. In most cases, however, the institutions have wanted to continue collaborating. In the latter case, the costs and effort required to maintain links can become a constraining factor. Research institutions often lack the resources to pay for linking mechanisms such as regular meetings, publications. Unless there is a logical coordinating institution such as a regional or international research centre, it is difficult to select one institution to carry this burden alone. Thus the intended

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permanence of a network should be addressed at an early stage of definition and the financial and coordinating requirements of a network should be periodically reviewed.

The most significant disadvantage of collaborative research programs are undoubtedly the cost in financial and human resources required to plan, organize and maintain a network. Participants should seriously examine whether this effort is justified in terms of the expected benefits, particularly if the network is expected to have a short lifetime.

One example of a network supported by IDRC in the Near East and North Africa is the food legumes network of projects. The relative neglect until recently of food legume research compared to the major cereals is probably partly responsible for the much faster increase in cereal production than in the production of food legumes. Per capita legume production in Asia and Africa has declined in the last 20 years suggesting that the nutritional quality of the diet of the poorest peoples may be deteriorating. Thus IDRC has encouraged research to develop legumes capable of giving higher yields and improved nutritional quality in the semi-arid tropics. Food legume research networks have been established in Africa and Asia. The network in the Near East and North Africa has expanded since the establishment in 1976 of the International Centre for Agricultural Research in Dry Areas (ICARDA). IDRC has provided continuing support to the food legume program at

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ICARDA since its inception. In addition IDRC is providing support for six national food legume research projects in Algeria, Egypt, Pakistan, Sudan, Syria and Turkey.

The general objective of the research network is to improve food legume production in the region by development of improved cultivars and appropriate agronomic practices. The specific objectives of each individual program in the network emphasizes the locally important legumes and their production constraints.

Each of these six national programs operates independently. Their objectives and priorities are determined locally. The focal point of the network is the Regional Pulse Improvement Program at ICARDA.

ICARDA provides the national programs with germplasm, entries, elite material and segregating populations. It also provides technical support in terms of methodologies, training and information exchange. National programs provides ICARDA with local germplasm, off-season nurseries and site-specific research data.