IDRC's Approach to Science and Technology for Development

Michelle Hibler

Summary. Canada's International Development Research Centre (IDRC) is an independent public corporation established to aid scientific research in developing countries. In supporting 849 projects in 100 countries, it has earned an enviable international reputation and has been used as a model for other aid agencies. Now entering its tenth year, IDRC is reaffirming its policies of responsiveness to the stated needs of developing countries and of strengthening their scientific and technological capabilities. It also seeks to encourage the application of Canadian R & D expertise to the solution of Third World problems.

The developing countries' share of the global R & D budget is only 3 percent. Their share of scientists and engineers in R & D is somewhat better, close to 13 percent. Still, there are only 300 scientists and engineers per million workers in developing countries, compared to 4000 per million in industrialized countries (*1*).

The implications of this scientific poverty in the Third World have been repeated many times during the past year, most forcibly by the Group of 77 before and during the United Nations Conference on Science and Technology for Development (UNCSTD) in August 1979: the developing countries are dependent on imported, and often inappropriate, technology for their development. The new scientific and technological order being called for is obviously a matter for politicians in both the industrialized and the developing countries, since it is they who draft the national science policies. But science and technology will lead to a better life only if competent personnel and institutions are present in those countries to effectively absorb and implement new knowledge and techniques.

The International Development Research Centre (IDRC) exists to contribute to that competence and to support science and technology in the developmental process. A publicly funded Canadian agency, IDRC has for 9 years embodied UNCSTD's objectives, which are, in the words of Joao Frank da Costa, secretary-general to the conference, "to make it possible to set up a science and technology structure in each developing country so that it can solve its own problems in its own way" (*2*).

The establishment of IDRC in 1970 was Canada's response to an earlier recognition of that need. The former chairman of the IDRC board of governors, Maurice F. Strong, with whom the idea for IDRC had originated, says that IDRC developed out of a need, not anyone's desire to create a new agency (*3*, p. 11):

> We started out with the feeling that this gap in science and technology was a fundamental one, that not enough was being done in this area, and asked, How can Canada take an important initiative in the area? And the IDRC, after a long process, became the initiative. It was clear from our examination that it was going to be difficult to give to the developing countries the kind of objective assistance that would add to their own research and technological capability within the framework of a conventional aid program.

What was needed was an agency "one step removed from the day-to-day political process"; that is, one that did not need to provide immediate results.

Status and Mandate of IDRC

Freedom from bureaucratic and financial restraints has been seen as necessary for financing long-term, high-risk research in the Third World. Thus, when IDRC was created by an Act of the Canadian Parliament in May 1970 (*4*), it was established as a public corporation to be financed by appropriations made annually by Parliament, but with its direction and control in the hands of an autonomous and international board of governors (*5*). Former IDRC governors include such personalities as Lady Jackson (Barbara Ward), the Honorable Lester B. Pearson, and Theodore W. Schultz, recipient of the 1979 Nobel Prize for Economics.

To help ensure its autonomy, the corporation was not made part of the Public Service of Canada, was made tax-exempt, and was not subjected to many of the financial requirements levied on Crown corporations and government departments.

The Act stated the purpose of IDRC as "to initiate, encourage, support and conduct research into the problems of the developing regions of the world and into the means for applying and adapting scientific, technical, and other knowledge to the economic and social advancement of those regions." In carrying out those objectives, IDRC was empowered

> to enlist the talents of natural and social scientists and technologists in Canada and other countries; to assist the developing regions to build up the research capabilities, the innovative skills, and the institutions required to solve their problems; to encourage generally the coordination of international development research; and to foster cooperation in research on development problems between the developed and developing regions for their mutual benefit.

The Act has proved to be an extremely broad piece of legislation, providing great flexibility. The IDRC can fund research in developing countries or in Canada and can establish, maintain, and operate information and data centers and facilities for research and other activities relevant to its objectives. Its status as a public corporation allows it to offer completely untied aid.

IDRC's Policies

The direction that IDRC took in interpreting this legislation was a result, first of concepts put forth by Mitchell Sharp, then Minister for External Affairs, in his speech to the House of Commons during the second reading of the bill, and later of the leadership of W. David Hopper as the first president of IDRC. Sharp said that IDRC "will give high priority to pro-

Michelle Hibler is editor-in-chief in the communications division of the International Development Research Centre, Ottawa, Canada K1G 3H9.

0036-8075/80/0718-0362$01.50/0

grams that assist the developing countries to build their own scientific and technological capabilities so that they will not be mere welfare recipients, but contributors in their own right to the solution of their own problems" (*6*).

Hopper, now vice president for South Asia at the World Bank, is an agricultural economist who has worked with the Ford and Rockefeller foundations in India and as a consultant to the World Bank. His active role in the Green Revolution convinced him that science has much to offer the Third World. At the first meeting of the board of governors in October 1970, he said that great care had to be exercised in choosing the focus of IDRC's efforts. "We seek to apply science directly and through research to the needs of development, and to help in creating in developing regions a capacity that will enable them to bring the methods of scientific enquiry to bear on the solutions of their own problems." The IDRC's programs would aim to promote the welfare of people in rural areas throughout the world and would "seek to find ways to bring help to those who are least able to benefit immediately from presently available technologies" (*7*). It was clearly recognized that, while it may be relatively easy to establish a research institute in a developing country, it is far more difficult to build links between the researchers and those who need the technologies the most.

Hopper then outlined what he called the style of IDRC's operations. There would not be a large in-house research capacity. Contracts and short-term consultancies would give management flexibility and prevent a surfeit of obsolete talent. Whenever possible, IDRC would try to involve several institutions and countries in its grants, and the grants would supplement locally supported activities. Local researchers' activities would also be expanded to allow collaboration with those engaged in similar problems elsewhere in the world, thus fostering mutual self-reliance. The bulk of IDRC's funds would be concentrated on problems of regional and international significance, not just those of interest to one country. And a substantial allocation would be used for training personnel, usually as a component of a specific project.

In short, Hopper proposed that IDRC support projects that would be conceived, planned, and executed by Third World scientists. This approach, central to IDRC's philosophy and operations, has been followed in the years since. At the time, though, it was a radical departure from official development assistance practice. Says Jorge Sabato, research professor and member of the board of directors of the Bariloche Foundation in Argentina (*3*, p. 38):

> No other international organization before that was courageous enough to trust the capabilities, the intelligence, the honesty of Third World researchers and say, well you have the ball, you go and play, without being "controlled" by Big Brother. This was a key issue. The program trusted the quality of people in the Third World and it also gave them the opportunity to develop their own capabilities.

The IRDC did, however, reserve the rights of audit and of periodic reviews of the projects it supported.

This emphasis on the indigenization of research is reflected in IDRC policies. First, IDRC endeavors to accept and support project priorities that are set by the developing countries themselves. Second, it focuses support on researchers indigenous to developing regions. Third, it recognizes the importance of process-oriented research; that is, of on-the-job research opportunities and training of Third World research scientists and technologists.

The Programs

To render more manageable IDRC's extremely broad objectives, four program divisions were established: agriculture, food, and nutrition sciences; health sciences; information sciences; and social sciences (Table 1).

The largest part of IDRC's support (Canadian $11 million in 1978–1979) is channeled through the agriculture, food, and nutrition sciences division, which concentrates on improving staple food crops and cropping systems, forestry (agroforestry and afforestation), aquiculture research, home- and village-scale food-processing systems, and animal production systems (*8*). The semiarid tropics are a major focus of the crop improvement and forestry programs. For example, a cooperative network of some 20 projects in savanna forestry is being supported in a dozen countries of Africa and the Near East. In four Sahelian countries, IDRC is supporting another network aimed at breeding and selecting high-yield, pest-resistant varieties of cowpeas (*Vigna unguiculata*), a legume that provides as much as 70 percent of the dietary protein of the people in this region.

The health sciences division concentrates its support in basic health services (particularly the delivery of health care in rural areas), control of major tropical diseases, water supply and sanitation systems, and methods of fertility regulation. An early supporter of the World Health Organization's Special Programme for Research and Training in Tropical Diseases, IRDC has also supported individual projects whose objectives are within the scope of that program—such as the control of onchocerciasis in West Africa (Fig. 1) and of schistosomiasis in Egypt, where this debilitating, snail-borne disease affects up

Table 1. Distribution of IDRC funds through 31 March 1979 (C$, thousands).

Region of activity	Program divisions							Total	Percentage of total
	Agriculture, food, and nutrition sciences	Communications	Health sciences	Information sciences	President's office	Senior vice president	Social sciences		
Africa	16,064		3,988	3,919		635	3,657	28,263	18.27
Asia	21,053	145	7,295	5,233	30	44	12,823	46,623	30.14
Middle East	7,508		662	972		202	422	9,766	6.31
Caribbean and Latin America	12,371	39	5,653	4,497			9,440	32,000	20.69
Canada	2,475	7	424	2,428		2,367	11,631	19,332	12.50
Other	2,629		5,154	1,495	100	1,276	8,052	18,706	12.09
Total	62,100	191	23,176	18,544	130	4,524	46,025	154,690	
Percentage of total	40.14	0.12	14.98	11.99	0.09	2.93	29.75		100

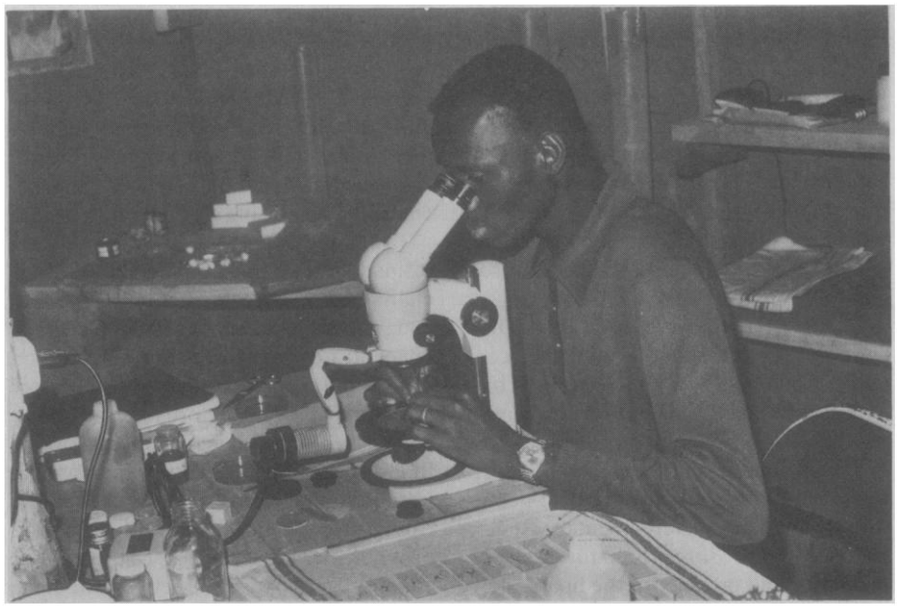

Fig. 1. At a field research station in Ivory Coast, an entomologist dissects blackflies (*Simulium damnosum*), vectors of onchocerciasis, in a effort to break the disease's cycle of transmission.

to 50 percent of the population. An important step in controlling schistosomiasis was made when public health researchers in Alexandria began pitting a common weed, *Ambrosia maritima* (damssissa as it is known in Arabic), against the snails (*9*). Damssissa contains a powerful molluscicide that is water-soluble. Laboratory experiments have shown that infusions of damssissa in water (1:1000) effectively kill all the common snails, affect the viability of schistosome eggs, and are lethal to the miracidia and cercariae (fish and other animals are not affected). Field testing is now under way.

The social sciences division investigates the impact of modernization and change on the developing world. This includes research into low-cost housing, provision of serviced lots, and evaluations of major development schemes such as the construction of the Jonglei Canal in the Sudan. Other sectors deal with the formulation of appropriate science and technology policies, such as the Science and Technology Policy Instruments project (*10*) supported in ten countries of Latin America, Asia, and the Middle East; studies of the determinants of population change and its effects on social and economic development; and research leading to more efficient management of development activities.

The division's education program researches the basic cycle of education. This includes studies of innovations in the primary school system, retention of literacy skills, and the role of teachers. A second focus is the transition from school to work through studies of vocational and technical training, education and the labor market, and the performance of graduates. The encouragement and utilization of educational research itself is the third area of concentration. The IDRC was a leader in establishing the Research Review and Advisory Group and continues to be concerned with the advancement of research training and practice in the Third World.

To ensure that the results of scientific research are available to those who need them most, the information sciences division assists in the compilation of international bibliographic information systems and helps regional groups and individual countries to participate in these systems. It also supports the creation of specialized information systems, such as the Cassava Information Centre in Colombia and the Ferrocement Information Centre in Bangkok; the improvement of industrial extension services; development-related communications research; cartography; and the improvement of library services.

Getting Results

The IDRC was structured so that it would not have to prove immediately the effectiveness of the research it supported. But it is clear that results have been achieved in the past 9 years. Of the 849 projects and supplements (*11*) supported to 31 March 1979 at a cost of C$155 million, 332 are complete and many have entered a second or even a third phase, building on the results of previous research. Some examples of IDRC's successes follow.

In 1976, the first successful breeding of the milkfish (*Chanos chanos*) in captivity took place in the Philippines in an IDRC-supported project. The technique—injecting gonadotropin extracted from British Columbia salmon—was first developed by the Vancouver laboratory of the Fisheries Research Board of Canada. It was a major breakthrough in aquiculture research, with significant economic implications for Southeast Asia, where milkfish are widely cultivated by small farmers. In 1978, researchers at the Malaysian Agriculture Research Development Institute succeeded in breeding carp in captivity year-round (Fig. 2). The IDRC is continuing to help both organizations refine the breeding techniques developed.

Computers have greatly facilitated the processing of bibliographic data, but because of their cost are not always available to those who need them. A major advance toward solving this problem was made when IDRC completed its programs for a minicomputer-based bibliographic system. This software package, known as MINISIS (*12*), operates on a Hewlett-Packard 3000 series II computer. Drawing on the ISIS (Integrated Set of Information Systems) package developed by the International Labour Office, it was designed to run IDRC's library operations and to be installed in institutions that need a reliable and inexpensive system. Several developing countries have expressed an interest in acquiring the MINISIS system, and a complete package that includes documentation, training, and implementation assistance is being prepared.

An IDRC-supported study in northwestern Zaire showed that cassava, the region's staple food, plays a role in the etiology of goiter and possibly cretinism, which are endemic in this area (*13*). Cassava consumption in man increases the concentration of thiocyanate in the serum and urine and increases iodine excretion. The thiocyanate concentrations are correlated with the prevalence of goiter in villages in which there is a uniform iodine deficiency. Cretinism also seems to appear in the population when a critical mean concentration of thiocyanate is reached. Serum levels of thyroxine, thyrotropin, and thyroid-stimulating hormone, characteristic of severe hypothyroidism, were also found in about one-third of the newborns and one-fourth of the infants in spite of the absence of clear

clinical signs of hypothyroidism. A second phase of the study is under way to define the nutritional conditions required for cassava to induce goiter and cretinism and to study the factors responsible for mental retardation resulting from a cassava-based diet.

To provide universal primary education without the crippling associated costs, the Centre for Educational Innovation and Technology, a research group of the Southeast Asia Ministers of Education Organization, launched Project IMPACT (Instruction Managed by Parents, Community, and Teachers) in the Philippines and Indonesia in 1974 (*14*). Project IMPACT draws on all the resources of the community. The pupils teach themselves or each other by using instructional booklets called modules, which cover each year's work in small segments. Also, older pupils help teach the younger ones. The IMPACT system is being extended in the Philippines and is being adapted for use in Malaysia and Jamaica.

Fig. 2. At the Malaysian Agriculture Research Development Institute, carp are induced to breed by injections of gonadotropin, a hormone extracted from the pituitary of Pacific salmon.

Problem Areas

Not all IDRC projects meet unqualified success, nor is it expected that they should. But even when the results differ from those that are sought, a great deal is learned in the process, and ideas for future research are generated.

Certain problems hinder the implementation of projects. In some cases, unforeseen political events greatly delay operations. Sometimes delays in training, or attrition of trainees, hold projects up. Because of strict foreign currency regulations in some countries, it is sometimes difficult or impossible to order needed equipment and supplies. Spare parts can be unavailable locally. Administrative delays mean that it may take months for the grant agreement to be signed by the recipient or for the funds to be channeled through umbrella organizations.

Many projects depend on the leadership of one or two key individuals. Research managers are highly sought after, and IDRC project leaders are often offered positions of responsibility in government posts or international research centers or agencies, to the detriment of the project. Young researchers may leave to pursue studies abroad, funded by other agencies.

Not surprisingly, a lack of coordination between corecipients of a grant is sometimes evident, as is a lack of communication between the research scientists and economists. One area that has often developed slowly is the relation between research, extension, and beneficiary.

Experience has shown that the most crucial period in a project's life is the first 3 to 6 months. In some recipient institutions the infrastructural support is severely limited, and the project suffers or dies. If a consultant or adviser is to be engaged, this is the critical phase for his contribution.

In making its grant agreements, IRDC retains patent rights for technologies that may result from a project, thus ensuring that such technologies will be available to all developing countries. The effectiveness of some projects has been limited nevertheless because, although the results were brought to the development stage, there was no follow-through to commercial exploitation. This aspect of IDRC's programs is now receiving greater attention. Recently, IDRC cooperated with a Canadian laboratory by making available its knowledge about induced breeding of milkfish. The laboratory is undertaking to provide crude salmon gonadotropin on a commercial basis and other hormones for use in research in Southeast Asia.

Meeting Basic Needs

Although IDRC-supported projects range from the mundane, such as designing better pit privies for squatter settlements in Africa, to the exotic, such as improving quinoa (*Chenopodium*), a pseudocereal first cultivated by the Incas in the Andes, the principle of satisfying basic requirements underlies them all. Says IDRC president Ivan L. Head, "The provision of 'essential needs' is the current developmental goal of governments and institutions. It is wise and necessary. For IDRC, 'essential needs' is not a catalogue, it is a concept."

Institutions and trained manpower are obviously high on the list of essential requirements. Most projects therefore provide opportunities for both junior and senior researchers to broaden their experience through further specialized study, practical training, or both. A human resources awards program also provides Canadians and citizens of developing countries the opportunity to undertake training or research in various aspects of development.

The IDRC has also been instrumental in the establishment of a number of agricultural research institutes, the newest being the International Council for Research in Agroforestry (ICRAF) in Nairobi, Kenya. But, although IDRC's policy is not to fund core research indefinitely, the slowness of donor agencies to increase contributions to some international institutions has meant that IDRC has had to continue support beyond the date when these institutions were expected to be self-sustaining. This has occurred in a number of otherwise successful projects, such as the West African family health periodical *Famille et Développement*.

In cooperation with other agencies, bilateral and multilateral donors, and private foundations, a number of programs have been launched to support Third

World research. This has led to the joint financing of research projects such as the Bellagio review groups in education and health. In some instances, major development agencies have moved in with capital projects when IDRC research efforts ended. The integrated rural development program in Caqueza, Colombia, for example, encouraged the funding of Colombia's 5-year, U.S.$355 million Rural Development Program by the Inter-American Development Bank, the International Bank for Reconstruction and Development, the U.S. Agency for International Development, the Canadian International Development Agency, and CARE (Fig. 3) (*15*).

The IDRC also supports research in Canada and other developed countries in support of projects under way in developing countries. These projects usually involve fundamental studies for which facilities do not exist in the developing country concerned. For example, at the University of Manitoba and the University of Guelph, research is aimed at creating new primary varieties of triticale and improving existing winter-hardy varieties. The University of Waterloo designed a simple, rugged hand pump, made of polyvinyl chloride tubing, that is being tested in eight African and Asian countries.

Future Directions

There will probably be more cooperative ventures in the next few years as a new policy of encouraging the application of Canadian R & D capabilities to the solution of Third World problems is implemented (*16*). The Canadian delegation to UNCSTD announced that IDRC would be invited "to provide the necessary expertise, initiative, and leadership to the new program." To support this activity, it was recommended that IDRC's annual grant be increased over 5 years to a total of 4 percent of Canada's official development assistance (ODA) (*17*). It was specifically stipulated that "such Canadian resources should, wherever possible, be applied through cooperative or joint R & D ventures with organizations in developing countries or regions with the aim of enhancing their indigenous capabilities." This was a direct response to the call of the Group of 77 that "direct linkages should be established between the research and development systems of developed and developing countries through cooperative arrangements" (*18*).

However, concern has been expressed in the international development community and at UNCSTD itself (*19*) that the proposal will change IDRC's direction by linking Canada's development assistance more directly to national scientific and technological activities. Ivan Head is quick to point out that "the action proposed—an increased emphasis on the use of Canadian R & D capacity and research of 'mutual benefit'—is already part of IDRC's mandate."

During IDRC's first 9 years, the concept of research for mutual benefit has been given less emphasis than the task of assisting the developing countries to build their own capabilities. "There is no suggestion in the new policy that this activity would cease or be curtailed," says Head. The announcement of the policy in August 1979 stressed that "we are conscious of the need not to divert the Centre from continuing its current emphasis on supporting research by developing country researchers in their own countries." It was further stated that "the results obtained by IDRC have led us to believe that the approach used is a sound one and that the IDRC model could perhaps be of interest to others." The Swedish Agency for Research and Cooperation with Developing Countries, organized in 1975, and the U.S. Institute for Scientific and Technological Cooperation freely acknowledge their debt to the IDRC model (*20*).

Despite the recognition that IDRC has been effective, it has not been excluded from the recent budgetary restrictions that have affected all Canadian government departments and corporations. Its grant for the 1979–1980 fiscal year was frozen at the previous year's level of C$36.8 million. Worldwide inflation and the continued decline of the Canadian dollar have also reduced IDRC's spending power. In order to meet long-term commitments, a number of cost-cutting measures were instituted, including the closure of the regional office for East and Central Africa in Nairobi. New management and evaluation procedures were developed to help ensure that the core of IDRC's activities—the program projects—continues to be protected.

Since his appointment in March 1978, Ivan Head, who for 10 years was Prime Minister Trudeau's foreign policy adviser, has continually voiced his adherence to the original broad concepts of IDRC policy, such as the need to follow the research priorities of developing countries and the independence of IDRC from the Canadian government. This commitment was further strengthened at the June 1979 meeting of the executive committee of the board of governors and at the full meeting of the board in October. It was emphasized that any additional funding IDRC might receive to carry out the new

Fig. 3. Rural development project in Caqueza, Colombia. Agricultural technologies developed through the Caqueza project are now being applied throughout the country. The rural poor are a focus of IDRC's activities.

program should be employed only on the clear understanding that IDRC's independence not be weakened, and that there be no impairment of its integrity or credibility in the eyes of the developing countries. Any future enlisting of Canadian R & D expertise toward solution of Third World problems will be made in direct response to the stated needs of those countries.

The board of governors also approved continuing IDRC's emphasis on supporting research that benefits the rural areas of developing countries, despite the growing trend among international aid agencies to channel support to the mushrooming cities of the Third World. Eighty percent of the population of the developing countries is still rural, and it was felt that the rural sector has been the last to receive the benefits of science and technology. The poorest countries will also continue to be focused on, particularly those African nations where development is lagging. The emphasis will be on building up indigenous research capabilities by funding small projects that will enable researchers to gain experience.

The small number of experienced scientists and the weakness of many research institutions in the least-developed nations is a constraint to the expansion of IDRC programs in these countries. It raises the issue of whether IDRC will need to provide more assistance to define, develop, and monitor research projects. The IDRC has avoided technical assistance in the past and has limited the equipment component and the role of advisers. These practices may have to be reexamined.

It is also necessary for IDRC, like other donor agencies, to look at the long-term picture and not merely the achievement of short-term results, since the development of indigenous capabilities requires sustained involvement with institutions and researchers.

There is, moreover, a need to recognize the fundamental importance of training. Many donor agencies have allocated more funds for training than research, but support for training programs appears to be diminishing. In the future, IDRC's human resources program will be more closely aligned with ongoing programs. It will attempt to meet some of the pressing needs of developing countries while recognizing the limited impact that IDRC can have in relation to total training needs. The growing heterogeneity of developing countries suggests that IDRC should develop a flexibility that would permit support for programs focusing on research results and more complex research objectives in some cases, and on long-term building of institutions in others.

The IDRC's effectiveness in achieving its objectives is being closely reviewed, and strategies are being set for the 1980's. The decision has been made to deliberately avoid stagnation and bureaucratization. Carl-Goran Heden, professor at the Swedish Medical Research Council and recently appointed member of the IDRC board of governors, points out that IDRC is a "social innovation." Its success, he says, carries with it the responsibility to generate new ideas.

The spirit of innovation that carried IDRC through its first decade should continue to pervade its operations, but not only because IDRC is actively seeking new ideas. As John Gill, director of the health sciences division, expressed it to the governors, "the question is not where are we going . . ., but where are they [the developing countries] going to take us?"

References and Notes

1. C. Norman, *Knowledge and Power: The Global Research and Development Budget* (Worldwatch Institute, Washington, D.C., 1979), pp. 10–11.
2. J. F. da Costa, *The Courier, Africa-Caribbean-Pacific-European Community* **55**, 65 (1979).
3. D. Spurgeon, Ed., *Give Us the Tools, Science and Technology for Development* (IDRC, Ottawa, 1979).
4. International Development Research Centre Act, *Revised Statutes of Canada* (1970), Suppl. 1, chap. 21.
5. The IDRC act requires that 11 of the governors be Canadian citizens. The practice to date has been to appoint the ten other members from other countries, with six among them from developing countries. The current board includes one American, Ray A. Goldberg, professor of agriculture and business at Harvard Business School.
6. M. Sharp, speech before the House of Commons, Ottawa, 12 January 1970.
7. W. D. Hopper, statement at the inaugural meeting of the board of governors of IDRC, Ottawa, 26 October 1970. See also S. Seward, *The Evolution of the International Development Research Centre* (IDRC, Ottawa, 1975).
8. International Development Research Centre, *Agriculture, Food and Nutrition Sciences Division: The First Five Years* (IDRC, Ottawa, 1975); C. Sanger, G. Lessard, G. Poulsen, *Trees for People: An Account of the Forestry Research Program Supported by the International Development Research Centre* (IDRC, Ottawa, 1977); B. Stanley, W. H. Allsopp, F. B. Davy, *Fish Farming: An Account of the Aquaculture Research Program Supported by the International Development Research Centre* (IDRC, Ottawa, 1978).
9. A. F. Sherif and M. F. El-Sawy, *Bull. High Inst. Publ. Health Alexandria* **7**, (No. 1) (1977).
10. F. Sagasti, *Science and Technology for Development: Main Comparative Report of the Science and Technology Policy Instruments Project* (IDRC, Ottawa, 1978).
11. R. Shirkie, *International Development Research Centre Projects, 1970–1978* (IDRC, Ottawa, 1978); *IDRC Annual Report, 1978–1979* (IDRC, Ottawa, 1979).
12. F. A. Daneliuk, *Information Retrieval and Library Management: An Interactive Minicomputer System* (IDRC, Ottawa, 1979).
13. P. Bourdoux, F. Delange, M. Gerard, M. Mafuta, A. Hanson, A. M. Ermans, *J. Clin. Endocrinol. Metab.* **46**, 613 (1978); C. H. Thilly *et al.*, *ibid.* **47**, 354 (1978).
14. C. Sanger, *Project Impact: A Progress Report on Innotech Project Impact in the Philippines and Projek Pamong in Indonesia* (IDRC, Ottawa, 1977).
15. H. Zandstra, K. Swanberg, C. Zulberti, B. Nestel, *Caqueza: Living Rural Development* (IDRC, Ottawa, 1979), p. 308.
16. M. Asselin, speech delivered at the United Nations Conference on Science and Technology for Development, Vienna, August 1979.
17. The IDRC's grant for 1979–1980 represents a little more than 3 percent of Canada's ODA of C$1.2 billion for the same fiscal year.
18. *Group of 77 Position Paper A 43 A/Conf 81/PC/CRP.5* (U.N. Office for Science and Technology for Development, New York, 3 May 1979).
19. S. Yachinsky, *New Sci.* **82**, 523 (1979); C. Norman (*1*), pp. 47–48; K. McKinley and R. Young, *Technology Transfer and the Third World: The Issues and the Role for Canada* (North-South Institute, Ottawa, 1979), p. 58; *Retort No. 2 (Vienna)* (22 August 1979), p. 1.
20. G. Richert and P. Lyman, papers presented at the Symposium on Science and Technology for Development, Toronto, May 1979.