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COOPERATIVE INTERNATIONAL DEVELOPMENT RESEARCH

TOWARDS AN ENHANCED APPLICATION OF CANADA'S R & D EXPERTISE TO PROBLEMS OF THE DEVELOPING COUNTRIES

Vol I

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COOPERATIVE INTERNATIONAL DEVELOPMENT RESEARCH

TOWARDS AN ENHANCED APPLICATION OF CANADA'S R & D EXPERTISE TO PROBLEMS OF THE DEVELOPING COUNTRIES

Vol I

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Ministry of State for
Science and Technology

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ACKNOWLEDGMENTS

This study represents, to some small degree at least, the kind of cooperative venture it seeks to promote in another field. Breadth of subject matter and strictly limited time demanded that many busy people turn aside from their own priorities to give freely of their time and experience. This they willingly did and in so doing made the study possible.

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All these people are drawn together by a common concern for the many poor in the developing countries of the world. To all a debt of gratitude is formally acknowledged and the hope expressed that this study may, in its own small way, make a contribution.

AD HOC INTERDEPARTMENTAL WORKING GROUP
ON THE
APPLICATION OF CANADIAN R&D RESOURCES
TO INTERNATIONAL DEVELOPMENT

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STUDY PRESENTATION

For maximum reader convenience the study is presented in two volumes.

Volume I: Main body of study.

Volume II: Supporting data and sub-studies comprising:

- Relevance of Canadian R&D expertise to problems of developing countries.
- Policies and mechanisms of other selected industrialized nations.
- IDRC projects by Canadian performer.
- CIDA, R&D projects, 1977/78.

INTRODUCTION

1. Background. One of several major issues arising out of preparations for the 1979 U.N. Conference on Science and Technology for Development (UNCSTD) is the request that the industrialized nations increase substantially the application of their own domestic research and development, (R&D), capacity to the solution of problems of the developing countries.

2. In January 1979, one of several working groups of officials of the Federal Government preparing for UNCSTD decided that this issue held sufficient promise to warrant a study being undertaken. The Ministry of State for Science and Technology was therefore requested to carry out such a study in cooperation with other interested departments and agencies of the Federal Government and officials of the International Development Research Centre (IDRC).[1]

3. Terms of Reference. Within the framework of the interdepartmental preparations for the U.N. Conference on S&T for Development:

(a) to carry out a cooperative interdepartmental review of the application of Canada's R&D capabilities to international development, and;

(b) to recommend ways and means of enhancing its application within a system controlled by CIDA and IDRC as appropriate.

4. Scope. Ideally, a study of the application of Canada's R&D activities to international development should cover all major resource sectors, actual or potential, such as the science and technology, (S&T), oriented departments and agencies of the Federal Government,provincial research centres, universities and industry.

5. Sheer lack of time and resources however resulted in a decision to concentrate on broad policy and strategy aspects of the question leaving more detailed studies to be undertaken later as necessary. The same restraints demanded that attention be concentrated - although not exclusively - on the Federal Government sector. The Canadian International Development Agency, (CIDA), and IDRC, represent the main instruments through which Canada's S&T assistance is channelled, the departments of the Federal Government represent the single largest scientific resource of the nation, and

1. Membership of the Ad Hoc Interdepartmental Working Group is given on page ii.

a useful impression can be obtained through both of these sources of the degree to which the R&D potential of other sectors is utilized. Furthermore, data from these sources is more conveniently and readily available.

6. While the relevance and importance of the social sciences to the development process is fully acknowledged it was reluctantly decided to restrict the study to the natural sciences alone. In spite of this decision, the basic need is recognized for any R&D carried out on behalf of the developing countries to be done only with the latter's full cooperation and, through this, with a sound knowledge of the socio-economic environment into which the results of the R&D are to be applied. The importance of, and need for, such a cooperative approach is a re-occurring theme throughout the study and carries with it an implicit awareness of the sociological imperatives.

7. Finally, the need to leave time for the results of the study to be adequately considered by appropriate officials has necessitated its presentation as a summary working paper rather than as a full report.

NEEDS AND DEMANDS OF THE DEVELOPING COUNTRIES

8. The Widening Gap. In spite of two decades of international development the greater part of the citizens of the world are still denied adequate food, shelter, health and employment.[2] Not only is the gap between the developing and the industrialized countries widening but a new poor within the Third World itself - countries in a state of permanent emergency -[3] has appeared reflecting the failure of earlier beliefs that a simple infusion of capital and technology would galvanize under-developed societies into self-reliant growth.

9. New Emphasis. The growing crisis has led over the last decade to a call by the less developed countries (LDCs) for a radical re-structuring of the world's economic system and a move away from traditional aid into such areas as easier access to the capital and manufactured goods markets of the industrialized countries, commodity price stabilization, massive debt relief and a more effective and accelerated transfer of the technology.

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2. In its world development report (1978) the World Bank pointed out that more than 800 million people in the developing world still subsist "in a state of absolute poverty".

3. Strategy for International Development Cooperation, 1975-1980, (CIDA 1975).

10. The Transfer of Technology. The key role of technology in the development process has long been recognized. A broad and complex field it embraces a whole range of subjects and fields from science, finance, (foreign investment), legal rights (patents and licenses), to teaching (technical and managerial skills) and commerce (markets and foreign ownership). Its importance to the Third World is vividly illustrated by a recent study which estimated that developing countries would be paying some $9,000 million by 1980 for patents, licenses and know-how.[4]

11. The physical transfer of technology is one thing, its successful adaptation and implementation, however, quite another. The relevance of a given technology to a society depends upon many factors, a good many of which are non-technical in nature. Technology embodies to some degree the social as well as economic objectives of the society in which it is developed and these in the industrialized nations do not necessary match those of the poorer countries.

12. Much of the technology required by the Third World can be described as elegantly simple and more like the over-designed durable equipment of the pre-war era than the finely honed, high maintenance, shorter life equipment characteristic of today's industrial world environment. The need for assistance in the establishment of national capabilities to select, adapt and assimilate foreign technology is, therefore, a major new factor in the strategies of the Third World.

13. An Endogenous R&D Capability. If an indigenous technological infrastructure - in its widest sense - is an essential prerequisite for industrialization and economic growth then an R&D capability, albeit modest, is an equally key component of the technological infrastructure. It provides the essential base resource needed to help identify and understand national problems susceptible to a technological solution, to choose and adopt the most appropriate foreign technology and to develop or adapt local technologies. In short, it brings national, not foreign, eyes to bear on national problems, needs and potential.

14. The current R&D effort of individual developing nations varies greatly not only in its breadth but also in the different scientific sectors. Even in the most advanced, however, the current level is not commensurate with development needs. Figures of about 0.1% of GNP disbursed on R&D expenditures are typical compared with more

4. UNCTAD TD/B/AC.11; rev 2 1975.

than 1 - 2 % in the most highly industrialized nations. In total, the Third World only accounts for some 2 - 3 % of world expenditure on R&D[5] much of which being concentrated in relatively few countries.

15. This situation has been highlighted by the developing countries own preparations for UNCSTD, preparations which have identified major needs and obstacles inhibiting the development of relevant national and regional scientific and technological (S&T) capabilities. These include domestic policies to promote the establishment of necessary national S&T capabilities, inadequate trained human resources coupled with insufficient educational facilities, lack of adequate infrastructure and linkages both within it and with industry, lack of information and, above all, lack of financial resources to nourish corrective action.

16. While all the issues now emerging as the preparatory period of UNCSTD enters its final month are concerned with the enhancement of the application of S&T to international development, three are of particular relevance to this study. Although presented separately in the Third World text which forms the basis for UNCSTD negotiations they are in effect mutually supportive if not completely interlocking.

17. The first[6] calls for

> "action on the part of the developed countries to support and facilitate the internal efforts of developing countries to achieve development through the establishment of endogenous scientific and technological capacities".

18. The second seeks the agreement of the developed countries to[7]

> "Increase substantially the proportion of their research and development expenditures devoted to specific problems

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5. U.N. World Plan of Action for the Application of S&T to Development, 1971.

6. Recommendation A31. A/Conf.81/PC/CRP.5 dated 3 May 1979.

7. Recommendation A42(b).A/Conf.81/PC/CRP.5 dated 3 may 1979. The targets are: 0.05% of GNP to be devoted to the solution of S&T problems of the the developing countries. 10% of Gross Expenditures on R&D to be devoted to programs designed to solve problems of specific interest to developing countries. (Recommendation A52).

> of primary interest to developing countries in accordance with agreed targets. Research and development efforts of developed countries devoted to the problems of developing countries should be consistent with the priorities of developing countries and should provide for the active participation of developing countries in their design, planning, execution and evaluation."

19. Finally, to help weld those elements of the industrialized countries R&D efforts devoted to international development as close as possible to the socio-economic environments into which the results of the research is to be applied, the developing countries ask that[8]

> "Direct linkages should be established between the research and development systems of developed and developing countries through co-operative arrangements. Such arrangements should provide for the undertaking of joint research and development programs, which should be carried out to the maximum possible extent in developing countries, so as to exchange personnel and share results."

CURRENT APPLICATION OF CANADA'S R&D CAPACITY TO INTERNATIONAL DEVELOPMENT

20. Although a substantial contribution is made by Non Government Organizations (NGOs), the bulk of Canada's Official Development Assistance (ODA) - amounting in Financial Year (FY) 1977/1978 to over one billion dollars[9] - is administered by the Canadian International Development Agency (CIDA) and the International Development Centre (IDRC).

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8. Recommentation A43.A/Conf.81/PC/CRP.5 dated 3 May 1979.

9. $1,055,500,000. Source CIDA, Policy Branch, "Historical Series".

21. CIDA. An indefinable but substantial amount of Canadian technology is used and transferred as part and parcel of many of CIDA's bilateral projects. The development of national infrastructures in the power, transportation and communications sectors, the provision of water and health services, and the improvement of national capabilities in the agricultural, rural development and resource management fields, all involve to some extent the application of science and technology in its broadest sense.

22. In terms of bilateral technical assistance[10] CIDA disbursed in FY 1977/78, $56.6 M which amounted to 5.4% of total ODA (Table II page 22). Even more was contributed over the same period to the support of the technical activities of the UN and other international multilateral organizations - $84.9M or 8% of total ODA (Table II page 22). This latter included $6.36M to the chain of international agricultural research centres. Although no data is available, some Canadian S&T expertise will undoubtedly be used by these international multilateral organizations; none of the Canadian contribution is, however, tied to the use of Canadian resources.

23. CIDA has not todate considered it necessary to establish a focal point through which its many technical co-operative activities could be coordinated.[11] All bilateral projects are managed by the appropriate program officer concerned assisted, in the case of projects having an S&T element, by a small, dedicated, and efficient group of resource advisors representing most major disciplines.

24. Research itself does not enjoy a high priority within the Agency. A cooperative search of the approximately 3,200 projects active in FY 1977/78 identified only 28 as having some research element.[12] (The many institutional building or training projects in which some research may well have been done were not included). Of these 28, 19 were research projects or projects in which the research element was substantial - a total of $9.75M being

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10. Technical assistance "covers a wide range of activities including pre-investment studies, the supply of advisory and operating experts, the instruction of students and trainees, and the support of research institutions".
OECD Development Assistance Committee

11. Such a focal point is however actively under consideration. CIDA - "Technical Assistance and Development Cooperation". A Policy Framework, March 1979.

12. See Section IV of Volume II of this study.

disbursed on them during FY 1977/78.[13] (Two alone accounting for nearly $5M). Of the 19 'research projects', 2 were performed by non-Canadian organizations and 17 utilized Canadian R&D expertise, 11 of which involving some R&D being actually carried out in Canada. A full two-third of the projects were in the agricultural sector.

25. In sum, through the technological elements of many of its bilateral projects and in particular through its technical assistance program, CIDA makes a substantial contribution to assisting the developing countries build up their S&T capabilities. In so doing, however, the Agency has not chosen to apply to any significant degree, Canada's domestic R&D resources.

26. IDRC. IDRC was established in 1970 by Act of the Canadian Parliament "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."[14] It is unique, being a wholly funded national body yet a public rather than a crown corporation which ensures a large measure of autonomy. Able to respond fast and flexibly to project opportunities and with the bulk of its projects in and managed by the Third World, IDRC undoubtedly represents one of the most direct and innovative responses to the scientific needs of the developing countries made by any industrialized nation.

27. Though funded exclusively by Canada, the Centre is governed by an international Board of Governors drawn from ten countries of which six are developing countries. It has, from its inception in 1970 until October 1978, initiated over 800 projects calling for appropriations close to $143 M.[15] Its budget, in grant form, has increased steadily until its present 1978/79 value of $36.9M.

28. Simply stated the role adopted to date by IDRC is to support research for the developing countries, by the developing countries and in the developing countries. This is in line with the emphasis placed by the Governing Board on the objective of "assisting the developing regions to build up the research capabilities, the innovative skills and the institutions required to solve their problems". Research grants have been made to 100 countries and have

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13. Source: CIDA - Financial Services. May 1979.

14. An Act to Establish the International Development Research Centre. 1969-70, C.36.

15. Projects 1970-1978, IDRC.

covered a wide spectrum of scientific fields with the emphasis being placed in the agricultural sector. This strategy, coupled with the Governors from developing countries, has given IDRC staff an extremely valuable knowledge of the scientific needs and environment of the Third World.

29. While IDRC's concentration on supporting research within developing regions meets a major need it does nevertheless restrict the use by the Centre of the substantial expertise represented by Canada's scientific community. As illustrated by Table I, page 21, research activities using Canadian performers represented only 5% of the Centre's expenditures in the natural sciences for FY 1975/76, 6.4% in FY 1976/77 and 3.7% in FY 1977/78.[16] This translates into participation by Canadian performers in about only 54 projects.[17]

30. While current policies continue therefore, the IDRC, although very effectively supporting the development of indigenous scientific capabilities and infrastructures within the Third World itself, is not yet committed either to help meet the demands for more of Canada's domestic research effort to be devoted to the problems of developing countries or to respond to their appeal for more collaborative research to be undertaken with Canadian scientists.

31. Federal Government Organizations. The science and technology oriented departments and agencies[18] of the Federal Government are neither mandated nor directly encouraged to become involved in international development other than as part of their membership in the various international bodies which address this area (e.g., FAO. WHO etc.). In only one case - that of the Department of Agriculture - is international development listed among departmental objectives.

32. Some departmental resources are nevertheless utilized - almost exclusively by CIDA - typical activities being the acceptance of developing country nationals for training (including the provision of some actual training courses), the execution of resource surveys, expert advice to CIDA and above all, the provision of scientists, technologists, statisticians and other experts for periods of work actually in the Third World. With certain exceptions, however, this involvement is fully funded by CIDA, is peripheral to the main stream of departmental activities, and often acts to the detriment of the careers of those involved.

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16. Source: Main Estimates and Program Forecast, Science Addenda.

17. Section III, Volume II.

18. Hereafter for simplicity's sake - 'departments'.

33. No departmental expenditures on R&D for the developing countries were identified during FY 1977/78. However three departments (EMR, DFO, CDA)[19] participated in or managed 9 of the 28 research projects identified in CIDA during this period, two-thirds of these being performed by CDA (Section IV, Vol. II). Expenditures in FY 1977/78 in respect of these 9 amounted to $4.62M, over half of which being accounted for by the India Drylands Agricultural Project.[20]

34. For its part, the IDRC has, since its inception, only involved two departments in a total of 8 projects. Seven of these were carried out by the National Research Council, (NRC).

35. Other Sectors. As of December 1978 no less than 26 different Canadian universities were involved in 91 different CIDA projects, reflecting the Agency's use of this resource for a wide range of international development activities.[21] In terms of research projects however, (as opposed to the many individual researches undoubtedly carried out by Canadian university staff during involvement in other projects), universities were involved in 1977/78 in only 8 of the 28 identified within the Agency. IDRC on the other hand, has used Canadian universities in 31 of the 54 projects in the natural sciences area identified as using Canadian performers.

36. Only scattered examples of the use of the substantial research capabilities of the provinces and industry came to light during the study. The B.C. Research Council was used in 1975 by IDRC for research on fish pituitary extract, Canadian industry designed and developed the cane separating machinery which forms the keystone of the large CIDA Uplands Sugar Mill Project ($2.145M in 1977/78), and the Department of Agriculture reported using private sector resources in two of its eight externally funded research projects undertaken in 1977/78 for developing countries. Though a more detailed analysis would probably identify more involvement, the examples above are indicative of the low level of participation of Canadian provincial and industrial resources in R&D for the Third World.

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19. Energy, Mines and Resources (EMR), Department of Fisheries and Oceans (DFO) and the Department of Agriculture (CDA).

20. CIDA - Financial Services.

21. CIDA - Survey of Current CIDA Relations with Canadian Post-Secondary Institutions.

36. In sum, Canada through CIDA and particularly in the shape of the IDRC program, is making a very substantial, effective and innovative response to the need for the enhancement of the scientific and technological capabilities of a large number of developing countries. In its program todate, however, Canada has not chosen to respond to the Third World's request for a sizeable proportion of the national domestic R&D effort of the industrialized nations to be devoted to solving their problems, nor to meet their desire for more cooperative research to be undertaken with them.

RELEVANCE OF CANADIAN R&D TO THE THIRD WORLD

38. The very limited use made, in Canada's international assistance program, of domestic R&D resources inevitably suggests that such resources, developed to meet the needs of a northern industrial nation, will not be relevant to problems of developing countries. To examine this question, albeit in a superficial way, a short co-operative exercise was undertaken, to "match" existing Canadian R&D expertise to known needs of the Third World in certain key sectors.

39. The "Matching" Project. A brief survey was carried out with the assistance of the IDRC, the Resources Branch of CIDA and interested departments with the aim of developing evidence of areas of existing Canadian R&D which could, if so desired, be directed towards the solution of some of the many problems facing the developing countries. The survey consisted of the listing of major LDC needs in ten selected sectors,[22] and the identification of matching areas of existing Canadian R&D expertise. Where possible several detailed examples were given in each sector illustrating either the application of Canadian R&D to specific developing country needs or cases where obviously relevant expertise existed but could not be applied because of current policies.

40. Relevance. The results of the survey, (given in their entirety in Volume II), demonstrate that while cultural, geographic and climatic factors mould the main lines of national R&D there are many areas of surprising congruence in the problems of vastly differing countries. Canada's remote northern communities share common problems of communication, health delivery,

22. Agriculture, Fisheries, Forestry, Energy, Transportation, Telecommunications, Health, Water Supply and Sanitation, Environment, and Information Science/Statistics.

sanitation and economic energy supply with many developing countries; research to control the blackfly and spruce budworm is directly relevant to the locust problem and river blindness disease; the need for adequate housing and food is common.

41. In every sector reviewed, examples of Canadian R&D expertise of relevance to the problems of developing countries were found leading to the conclusion that a more detailed survey would uncover far more relevant expertise than could ever in practice be applied. Furthermore it became clear that much of this relevant R&D expertise lies in areas of priority interest to Canada itself - certain sub-sectors of renewable energy research such as photovoltaics, small scale hydro and wind machines being examples. This raises the real possibility that careful selection amongst available relevant R&D sub-sectors could product projects of genuine mutual value to both Canada and countries of the Third World.

OTHER INDUSTRIALIZED NATIONS

42. A short review was carried out, as part of the study, of the policies and mechanisms used by a selection of seven industrialized countries[23] in respect of the application of their domestic R&D resources to international development.

43. The review, which is presented in Volume II of this study, revealed several different models ranging from the substantial use by France of many long established laboratories, to the move by the FRG to involve its industry via its Ministry of Science. Two major common threads however run through the national approaches reviewed: all make substantial use of their domestic R&D capabilities within the various national aid programs and all use some mechanism through which this domestic resource is focussed.

44. Decisions on science and technology for the Third World are normally made within the context of the aid programs of the countries reviewed and the aid agencies normally use domestic R&D facilities as the executing bodies. In at least four cases[24] special research organizations solely devoted to developing country problems exist. In one unusual case - France - R&D for and in cooperation with the Third World is a stated priority in the National Plan (The Seventh, 1976-1980).

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23. The UK, France, FRG, Netherlands, Sweden, Japan and the U.S.A.

24. UK, France, the Netherlands and Japan.

45. Various mechanisms are used by these nations to focus the application of domestic R&D resources within the nation's aid program. These differ in extent and form but all involve senior representatives of scientific and aid communities in the strategic planning and coordination of development programs - if not in their actual execution. Many of these are of fairly recent origin, (Sweden, Japan, FRG, France, the Netherlands), and appear to emphasize the growing awareness of the substantial potential represented by domestic R&D capabilities and the concomitant need for a properly orchestrated national approach to their exploitation on behalf of the developing countries.

46. While it appears generally accepted, however, that where possible much of the R&D to solve Third World problems should be carried out within the Third World, using - and reinforcing - indigenous capabilities, only two industrialized nations, Canada and Sweden, have opted for this as a mainstay of their policies. Sweden with its SAREC followed, in 1975, the Canadian IDRC approach but modified it to involve a substantial use of domestic Swedish R&D capability, (about 1/3 of SAREC's budget). This year, subject to Congressional approval, the U.S.A. will establish a similar organization (the Institute for Scientific and Technological Cooperation) - again based on the "pure" IDRC model but expanded to involve the domestic U.S. scientific and technological communities.

AN INCREASED APPLICATION - THE BENEFITS

47. By its very nature, a positive response by Canada to a major demand by the Thrid World involves costs to the Canadian taxpayer, costs which are increasingly difficult to justify in the current difficult domestic economic climate. A response, therefore, which squarely meets a major stated LDC need while at the same time offering substantial domestic benefits to Canada is clearly worth careful consideration. The application of Canadian R&D resources to the solution of problems of developing countries would be such a case.

48. Resource Availability. The R&D capacity of the Thrid World represents a very small percentage (about 3 percent) of the available world total and this is, by and large, concentrated in a few of the more advanced developing countries. Even if massive funding were immediately available therefore - and it is not - years would pass before the indigenous R&D capabilities of Third World countries could be built up to meet their developmental needs. Direct and early access to the kind of major resources of knowledge, expertise and sophisticated equipment represented by Canada's R&D capacity would therefore represent a major benefit to developing countries.

49. Indigenous Development. Careful choice of problems to be researched and methods adopted could and, where at all possible always should, offer possibilities of a cooperative or joint venture approach. To the basic commitment of Canadian R&D to solve the problem could thus be added the major additional bonuses of training and information exchange, and of the availability of extra resources needed to build up an indigenous and self-sustaining "critical mass" of scientific effort required by the LDCs to mount national efforts in selected fields. The current twinning relationship between the new Brazilian Wheat Research Institute and the Canadian Department of Agriculture is a case to point.

50. Multiplier Effect. The use of Canadian R&D resources as envisaged in this study would represent an adaptation or extrapolation of a domestic R&D program. The funding provided to meet the costs of the "aid portion" of the project would therefore in many cases buy a considerable amount of R&D already done to meet purely domestic needs. Add to this the normal advantage offered by a shared cost project and a substantial "multiplier effect" could be applied to the basic "aid" funds disbursed. CIDA's current India Drylands Agriculture project is a good example.

51. Benefits to Canadian R&D. An R&D effort whether performed on behalf of the developing countries or together with them, in Canada or elsewhere, offers the major potential benefit of supplementing and enhancing Canada's own domestic R&D activities while directly meeting a major stated need of the Third World. As illustrated in Section I of Volume II not only are many areas of Canadian R&D expertise relevant, but some are aimed at meeting common needs - the renewable energy sector being one prime example.

52. To the potential represented by certain common research goals can be added several other direct benefits which could accrue in such areas as the different R&D environments offered by Third World countries, (e.g., shorter growth periods for genetic research or crop varieties) and the expertise held by some of their scientists in certain fields of research, - again the renewable energy field, particularly biogas or gasohol - springs to mind. Another less direct but potentially useful benefit to the Canadian scientist or technologist is represented by the broadening of experience offered by exposure to an entirely different work and research environment.

53. The S&T Community. The closer involvement of Canada's S&T Community resulting from an enhanced application of national R&D resources would bring benefits beyond the simple availability to the Third World of valuable resources. At present there is a strong sense of frustration within the community at what it perceives as being an ad hoc, piecemeal involvement in international development.[25]

25. Report from the SCITEC/Royal Society Committee on Reactions of the Scientific/Technical/Social Science Community to UNCSTD, page 4.

There is a need to encourage within the S&T Community an existing latent sense of committment to aid and to couple this with building an understanding of the needs and problems of the Third World which can only come from personal involvement in development projects. There is, in addition, a need for a certain continuity of involvement to ensure that skills and knowledge built up are not lost for want of a sense of direction. In short, a domestic R&D element would go a long way to involving in Canada's aid program a valuable and influential part of the community.

54. Canadian Industry. The potential of Canada's industrial R&D capability has been virtually unexploited within the international development context although industrialization has become a key national objective in many developing countries. Tantalizing glimpses of this potential are offered in the illustrations presented in Volume II. They include the adaptation of a Canadian radar altimeter system to tropical forest resource management, the insect swarm detection and combat system developed in Canada's eastern provinces, and the sugar cane splitting machinery conceived, designed and developed by Canadian firms which is now under large scale test in the Carribean.

55. While the involvement of Canadian industrial R&D would very likely be small within the foreseeable future, the benefits offered by the exposure to new future market opportunities are not inconsiderable - as witness the efforts of France, UK and FRG to involve elements of their industrial R&D capability - and would support the current national priority given to enhancing Canada's industrial R&D potential.

56. Foreign Policy Considerations. The options open to Canada and other industrialized nations to respond to the demands of the Third World within the framework of the "New International Economic Order" are becoming progressively limited by present widespread economic difficulties. This situation is compounded by the areas in which the developing countries are currently seeking special consideration - most of which are virtually non-negotiable. Yet the shared need for a stable world situation, let alone basic humanitarian considerations, demand that progress towards assisting the poor nations be vigorously pursued. Any initiative therefore which offers to Canada the possibility of making a positive contribution - possible because of its domestic benefit - justifies very close consideration. The application of some of Canada's R&D capacity to the solution of Third World problems represents such an initiative.

57. UNCSTD. To the responsibilities engendered by Canada's traditionally high reputation in the aid field is added, in the area of S&T, the developing countries' perception of Canada as having - as witness the extablishment of the IDRC - a special understanding for and knowledge of their needs. It is therefore to Canada that the nations of the Third World are already looking within the UNCSTD context, for support and advocacy on their behalf with other industrialized countries.

58. Canada's current economic difficulties, however, and in particular the need for increased government funding to support the enhancement of the nation's domestic R&D capability, will make it difficult to respond positively either to the call for the establishment of a new large international scientific fund to support the Third World or indeed to any other initiative calling for additional expenditures. The fact, therefore, that Canada has hitherto not chosen to apply some of its domestic R&D capacity to the problems of the Third World now offers the possibility - not shared by other industrialized nations - of directly responding to a major demand made within the framework of UNCSTD, yet responding in a way which retains the control (and some of the benefit) in Canadian rather than international hands. Such a response will NOT replace in its impact a generous contribution to the scientific fund; it will, however, offset an otherwise entirely negative response.

AN INCREASED APPLICATION PROBLEMS AND CONSIDERATIONS

59. The application, to any significant extent, of Canada's R&D capacity to international development would represent a major new approach rather than an incremental increase in present practices. Substantial policy, strategy and organizational considerations therefore arise.

60. Current Policy. In 1970 the Canadian Government, recognizing the key importance of R&D to the development process, focussed its activities in this area by the establishment of a unique and innovative organization - the IDRC.

61. The Centre owes much of its success to its international orientation and to the responsiveness assured by its virtual autonomy. These very factors, however, have conspired to seriously constrain Canada's S&T cooperation with developing countries. The very existence of IDRC inhibits CIDA from supporting research - expecially as research is one of many important and competing demands upon scarce resources. The Centre's successful program, coupled with Canada's generous contributions to various international development related R&D activities, also leads easily to an assumption that nothing further needs to be done in this area.

62. A further allied problem arises out of the fact that the mandate for applying the R&D component of Canada's aid program lies de facto in the hands of an organization which for all practical purposes lies outside of the domestic aid structure. With no clear domestic mandate, the R&D element remains understandably peripheral to the main stream of CIDA's aid policy and is applied in a fragmented and ad hoc manner. The same lack of mandate inhibits the departments of the Federal Government from responding more substantially to requests from CIDA for assistance.

63. IDRC Policy. The IDRC Act of 1970[26] specifically mandates the Centre to assist developing regions to build up indigenous research capabilities, to encourage the coordination of international development research, and to foster cooperation in research on development problems between developed and developing regions for their mutual benefit. Canadian resources as well as those of other nations were to be used to achieve the Centre's objectives.[27]

64. To date the IDRC has concentrated its resources on building the LDCs indigenous R&D capacities by supporting research to the Third World, in the Third World and by using almost exclusively scientists of the Third World. The emergence of this strategy as being the dominant theme of the forthcoming U.N. Conference on Science and Technology for Development bears tribute to the foresight and understanding of the Centre's officials. Nevertheless this policy explicitly ignores the Third World's request for a sizeable portion of Canada's R&D capability to be applied to their problems. It also ignores their desire for Canada to undertake cooperative research with them. While current policies hold, therefore, the application of Canada's domestic R&D resources to international development is specifically excluded from the main vehicle through which the Nation's S&T support to the Third World is channelled.

65. CIDA. Though a major consideration, the existence of IDRC is not the only factor inhibiting CIDA from making more use of research in its program. Research by its very nature tends to be long term, uncertain in execution, and with results which frequently require scientific competence to be fully appreciated. Often its fruits require further development to bring them on to the market or into the hands of the people. In the absence of an attitude and an environment more familiar with the characteristics of research it is hardly surprising that more concrete projects with a lower management to disbursement ratio are favoured by the Agency's planning and desk officers.

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26. Paragraphs 4(a) (b) (c) and (d) of the IDRC Act (1960-70 C36).

27. IDRC Act, paragraph 4(a).

66. The current reluctance of CIDA to undertake research projects, (as opposed to supporting research by international organizations), is further reinforced by an understandable desire to deliver to developing countries only tried and tested products.

67. A final but major psychological obstacle to the use of Canadian R&D resources is the natural reluctance of those engaged in international development to see aid resources tied. This reservation is more understandable where joint projects are to be undertaken in which the exact cut off between value to development as opposed to domestic benefit is very difficult to identify.

68. Strategy. Difficulties of assessing development and domestic benefits apart, a major consideration in favour of applying Canadian R&D resources to the problems of the Third World still remains the possibility of mutual benefit. Such benefit, however, will clearly not occur of and by itself. Mutual benefit or no, available resources will be scarce and their optimal application will depend on a careful strategy aimed at clearly identifying and matching to LDC needs those subsectors of Canadian R&D completence which are of domestic priority.

69. Focal Point. While a policy clearly supporting and encouraging the application of Canadian R&D to international development is a keystone to such activity, neither it nor a strategy to maximize mutual benefit will, by themselves, ensure optimal results. What is required is a lead organization with clear responsibility for ensuring that both policy and strategy are effectively applied; a focal point providing expertise, drive and initiative - above all an organization readily identifiable by and encouraging to Canadian researchers and technologists.

70. Such a focal point has ideally to meet three major criteria: it must have an intimate knowledge of the developing country environment into which the results of Canadian research are to be introduced; an equally sound knowledge of and links to the Canadian S&T community; and finally, a close familiarity with the R&D environment.

CONCLUSIONS AND RECOMMENDATIONS

71. Canada, particularly in the shape of the IDRC, is making an innovative and effective response to the need for the enhancement of the indigenous R&D capabilities of a large number of developing countries. This response however is concentrated upon one aspect - albeit a most important one - in the range of different types of scientific development assistance. The question now raised by the

preparations of UNCSTD is whether Canada should go one step further and meet the concommittent demands of the Third World for some of the Nation's domestic R&D effort to be devoted to helping solve their problems - and to do this where possible through cooperative R&D ventures.

72. Policy. Both current policy and the main vehicle through which policy it is delivered implicitly inhibit the application of domestic R&D resources to international development. Not only does this deny the developing countries access to valuable sources of R&D expertise but it also artificially constrains the flexibility of the Canadian government to respond to major new international initiatives such as the recent Bonn Summit call for the industrialized nations to assist the developing countries adopt renewable energy resource technologies.

73. A decision to change current policy and to enhance the application - in a modest and coherent fashion - of Canada's R&D capabilities to international development would be a logical progression from the present effective but restricted program in the S&T area. It would in addition seize the rare opportunity offered of directly meeting a major Third World demand while at one and the same time reinforcing and enhancing domestic R&D capabilities. It is therefore recommended that:

I) Current Canadian policy related to scientific and technological activities in support of the Third World be expanded to mandate and encourage, within the framework of the Nation's international development program, the application of Canada's domestic R&D resources to the solution of problems of the developing countries.

II) Such Canadian resources should, where at all possible, be applied through co-operative or joint R&D ventures together with appropriate organizations within selected developing countries or regions with the aim of enhancing the indigenous capabilities of those nations

74. In order to ensure that maximum benefit is derived for both recipient development countries and for Canada's own domestic R&D effort, it is further recommended that:

III) A deliberate strategy be followed which will ensure the best possible match between the selection of developing country problems to be addressed and areas of Canadian R&D competence of domestic value and importance.

75. Focal Point. Neither policy nor strategy will, however, of themselves automatically ensure the optimum use of scarce Canadian resources. This will only be achieved if a lead agency is given prime responsibility and clearly designated as the focal point for these activities. Such a focal point should provide the necessary initiative, drive and leadership to ensure that programs and participating bodies are welded into a coherent whole.

76. Canada is fortunate in already possessing-in the shape of the IDRC - an organization whose high reputation and wide credibility within the Third World reflects eight years experience of successfully delivering R&D support in an international development context. To this external strength is added a knowledge of, and links to, the Canadian S&T Community; links which could quickly be expanded to meet the needs of an enhanced domestic program.

77. In the confidence that the Centre will wish to exercise its existing domestic mandate and rise to this new and demanding challenge it is recommended that:

> IV) The International Research Development Centre be identified as lead organization and national focal point for the application of Canada's domestic R&D capacities to the solution of problems of the developing countries.

78. It is emphasized that the designation of a focal point should not inhibit CIDA from continuing and even enhancing its technical assistance programs including the transfer of Canadian technology and the results of Canadian research. Indeed, a major need of Third World countries is for a "total systems approach" to be applied to the establishment of indigenous S&T capacities; an approach which encompasses training, educational and capital as well as research elements. CIDA and IDRC will therefore wish to cooperate closely to ensure that the research component of Canada's international development program is harmonized within the whole.

79. Similarly the existance of the recommended policy should encourage and enable Federal Government departments to be more responsive to requests from CIDA or IDRC to act as executing agents or - to a modest degree - to provide other R&D assistance to the developing countries.

80. Finance. IDRC's program meets the most pressing need and demand of the Third World in a manner which has made it a model for other imitators, (Sweden and latterly the United States). It would therefore not serve the best interests of either the developing countries or of Canada's foreign policy if the Centre's already limited financial resources where directed to meeting another but not

so powerful need - particularly as the new response would bring substantial "tied" benefits to Canada. If the IDRC is to become the main vehicle through which Canada's domestic R&D resources are to be applied to international development, therefore, then an infusion of new funds to cover this application should be made.

81. One of the original concepts upon which IDRC's foreseen growth was based was "the allocation of as much as 5% of our total development aid funds to the Centre".[28] IDRC funding however, ceased to grow in financial year 1977/78 at which time its annual grant represented 3.14% of ODA. The last two grants (for 1978/79 and 1979/80) have remained stable at 3.05% of ODA and it seems unlikely, given the present economic climate, that further growth in real terms will take place in the foreseeable future.

82. Based upon domestic experience the Government of Canada has committed itself to increasing its expenditures onR&D as a means of more effectively meeting its economic goals. The demands made by the developing countries at UNCSTD clearly demonstrate that they share this perception of the importance of science and technology. It is therefore considered that a gradual growth in the budget of the IDRC to attain a figure of 4% of Canada's ODA is desirable; that this modest increase in funding would lie within the organizational capacity of the Centre; and that the extra finances would represent a reasonable share to be devoted to supporting Canadian activities. It is further considered that a target of 5 years would allow reasonable time for the Centre to build up its new program. It is therefore recommended that:

> V) The annual grant to IDRC be progressively increased over the next five years to attain a level of 4% of total Canadian Offical Development Assistance funds; these extra finances to be devoted solely to supporting the application of Canadian R&D resources to international development.

83. Finally, it has not been possible to consult with those sectors of the Canadian scientific and technological community whose good will and support are mandatory for the successful application of Canada's R&D capacities to helping developing countries. IDRC will thus wish to inform provincial governments and research organizations, the universities and Canadian industry of the new policy and to consult them in planning its implementation.

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28. Statement by the Secretary of State for External Affairs to the House of Commons, January 1970.

TABLE I

IDRC - EXPENDITURES ON RESEARCH AND EXPERIMENTAL DEVELOPMENT IN THE NATURAL SCIENCES

	Fiscal year ($ Canadian millions)		
	75/76	76/77	77/78
Intramural	-	-	-
R&D Grants			
- Canadian Industry	0.060	-	-
- Canadian Universities	0.446	0.835	0.275
- Canadian Provincial/ Municipal Governments	-	-	-
- Other	0.010	0.050	0.015
- Foreign Performers	9.803	13.743	13.861
R&D Felowships			
- Canadian	0.001	-	0.236
- Foreign	0.105	0.086	0.199
Total Expenditures			
- Canadian	517,000	885,000	526,000
- Foreign	10,425,000	13,829,000	14,060,000
- % age Canadian	5%	6.4%	3.7%

SOURCE: Main Estimates and Program Forecast Science Addenda.

TABLE II

CANADA'S EXPENDITURES ON MAJOR INTERNATIONAL TECHNICAL COOPERATION PROGRAMS, 1968-69 to 1977-78

($ MILLIONS)

	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78
UNDP	10.75	13.50	15.27	16.23	17.70	20.28	22.20	24.50	29.00	37.00
UNICEF	1.00	1.40	1.20	1.50	1.70	1.90	2.50	3.50	5.00	8.50
Total General UN Funds	11.75	14.90	16.47	17.73	19.40	22.18	24.70	28.00	34.00	45.50
IFAD										11.00
Others		0.81	0.59	1.93	1.38	2.96	4.04	5.78	5.15	6.36
Total Renewable Natural Resources		0.81	0.59	1.93	1.38	2.96	4.04	5.78	5.15	17.36
UNFPA			1.02	2.01	2.00	1.94	2.50	3.50	5.00	7.00
IPPF			0.51	0.77	0.99	1.50	2.00	2.50	2.75	3.25
Others			0.20	0.16	0.15	1.66	1.41	2.83	2.67	2.12
Total Population and Health			1.72	2.94	3.14	5.10	5.91	8.83	10.42	12.37
Total Education	0.06	0.06	0.22	0.17	0.28	0.36	0.31	0.41	0.47	0.43
CFTC	0.06	0.18	0.22	0.43	0.67	1.00	3.45	4.00	4.35	6.50
Others					0.02	0.22	0.26	0.63	0.82	1.50
Commonwealth & Francophone	0.06	0.18	0.22	0.43	0.69	1.22	3.71	4.63	5.17	8.00
IADB/SPPP						1.50		1.50	3.00	
Others	0.04	0.06	0.11	0.09	0.09	0.06	0.14	0.81	1.32	0.22
Total Development Banks	0.04	0.06	0.11	0.09	0.09	1.56	0.14	2.31	4.32	0.22
ITC						0.30		0.30	0.50	0.50
Others	0.13	0.12	0.06	0.27	0.23	0.09	0.12	0.32	0.62	0.54
Total Miscellaneous	0.13	0.12	0.06	0.27	0.23	0.39	0.12	0.62	1.12	1.04
TOTAL MULTILATERAL (A)	12.04	16.13	19.39	23.56	25.21	88.77	38.93	50.58	60.65	84.92
TOTAL BILATERAL (B)*	26.89	29.76	34.03	39.93	39.71	50.58	53.71	54.32	60.81	56.56
CUSO	2.37	3.26	4.25	4.85	6.70	7.30	7.20	8.26	9.10	9.33
CESO	0.31	0.52	0.62	0.68	0.87	1.00	1.20	1.22	1.30	2.80
TOTAL - MAJOR NGOs (C)	2.68	3.78	4.87	5.53	7.57	8.30	8.40	9.48	10.40	12.13
GRAND TOTAL T.A. (D)	41.61	49.67	58.29	69.02	72.49	92.65	101.04	114.38	131.86	153.61
TOTAL ODA (E)	212.6	278.9	348.9	398.3	511.3	594.7	749.3	909.6	972.5	1,055.5
(A) as percent of (E)	5.7	5.8	5.6	5.9	4.9	5.7	5.2	5.6	6.2	8.0
(B) as percent of (E)	12.6	10.7	9.7	10.0	7.8	8.5	7.2	6.0	6.3	5.4
(C) as percent of (E)	1.3	1.3	1.4	1.4	1.5	1.4	1.1	1.0	1.1	1.2
(D) as percent of (E)	19.6	17.8	16.7	17.3	14.2	15.6	13.5	12.6	13.6	14.6

* Bilateral technical assistance figures reflect only disbursements for students, trainees, cooperants as taken from the FRs. They do not include technical assistance provided by consultants in the context of resource studies, integrated capital assistance projects or other projects that involve counterpart in service training. (These are more difficult to obtain). To this extent, the figures understate the amount of Canadian bilateral technical assistance.

Source: CIDA, Policy Branch, "Historical Series".

STUDY RECOMMENDATIONS

The Ad Hoc Working Group, to which this study was presented on the 14 June 1979, accepted its recommendations with some changes in wording. The amended recommendations were subsequently accepted by the UNCSTD Policy Committee with the proviso that the actual level of additional funds in Recommendation V be decided as part of the aid strategy review currently underway.

The recommendations as finally accepted are given below with the changes in wording highlighted in italics.

I) Current Canadian policy related to scientific and technological activities in support of the Third World be expanded to mandate and encourage, within the framework of the Nation's International development program, the application of Canada's domestic R&D resources to the solution of problems of the developing countries.

II) Such Canadian resources should, where at all possible, be applied through cooperative or joint R&D ventures together with appropriate organizations within selected developing countries or regions with the aim of enhancing the indigenous capabilities of those nations.

III) A deliberate *comprehensive* strategy be followed which will ensure the best possible match between the selection of developing country problems to be addressed and areas of Canadian R&D competence of domestic value and importance.

IV) The International Development Research Centre *be invited to assume responsibility* as *the* lead organization and national focal point for the application of Canada's domestic R&D capacities to the solution of problems of the developing countries.

V) *Additional finances, growing progressively* over the next five years to attain a *level of at least 1%* of total Canadian Official Development Assistance funds, *be made available to IDRC; these finances* to be devoted solely to supporting the application of Canadian R&D resources to international development.