Ministry of State
Science and Technology

Ministère d'État
Sciences et Technologie

security classification
cote de sécurité

RESTRICTED
DIFFUSION RESTREINTE

SCIENCE, TECHNOLOGY AND THE NEW INTERNATIONAL ECONOMIC ORDER

THE TWINNING CONCEPT IN THE CANADIAN FEDERAL GOVERNMENT CONTEXT

VOLUME TWO

working paper

document de travail

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Ministry of State for
Science and Technology

December 1976

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INTRODUCTION

The identification and examination of existing twinning arrangements between Federal Government science intensive departments and agencies and their counterparts in developing countries was a major objective during the study. Three such bilateral linkages were found. Although not meeting all the criteria suggested for the 'ideal' they do nevertheless provide an informative insight into the current use of the concept. The intent, scope and impact of these together with some general comments are therefore offered for the interested reader.

Time did not permit an indepth review of the policies and use of bilateral linkages in the scientific area by other developed nations. Some insight however was obtained by a quick review of available papers and by information supplied by Canada's science counsellors at missions abroad. This, though incomplete, is considered to be pertinent because of the perspective offered into which Canada's present efforts in the scientific element of technical assistance can be fitted. As will be shown Canada is not the only industrialized nation which is considering the use of scientific institutional twinning to further national objectives in the international development field - indeed in some cases the use of the mechanism appears well established.

SECTION I - CASE STUDIES

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Variants of twinning procedures have been practised for many years as a part of Canadian technical assistance to developing countries (LDCs) in various fields and at various levels. However, most of the activity has been confined to the university sector where instead of a pure 'twinning' arrangement, emphasis has tended to be on institution-building, that is, setting up of a department/faculty in the LDC rather than undertaking a joint research project.

Within the Federal Government, the involvement of the science-oriented departments in providing technical assistance to developing countries (via CIDA) has been mainly in three areas: -

i) providing technical advisers abroad;

ii) undertaking resource surveys and feasibility studies overseas; and

iii) providing training to LDC personnel in Canada.

However, these activities have been approached either on an ad hoc basis or as support know-how for technological equipment being transferred overseas. Few of the science-oriented federal departments have a long-term sustained relationship with a research department in LDCs, and little if any research is carried out on their behalf in the federal departments.

Details of three projects currently underway which are unusual insofar as the substantial level of departmental involvement is concerned and which come near to the ideal 'R&D twinning arrangement' discussed in Volume I, are presented below.

des pêcheries des eaux intérieures

I. DOE - NATIONAL INLAND FISHERIES INST. PROJECT, THAILAND

The purpose of this cooperative Canada-Thailand project is to develop a National Inland Fisheries Institute (NIFI) in the Thailand's Department of Fisheries. NIFI will be located at the site of the present Bangkhan Fisheries Station on the campus of Kasetsart University in Bangkok. It will be responsible for conducting the applied research required to meet the development and management needs of Thailand's inland fisheries resources. The project was initiated in 1972 at the request of the government of Thailand.

Station de recherche sur les pêches

Project Activities

In order to help improve the extent and nature of Thailand's inland fisheries the Canadian Government is providing for the project: -

- certain specialized materials and equipment;

- long- and short-term experts to assist in planning and implementation of research and development projects; and

- academic and practical training programs in Canada and in Thailand for Thai staff of NIFI.

Training in Canada is to be provided in the following areas: fish ecology; fish population studies and fishery statistics; general limnology; water chemistry and pollutant chemistry; techniques of fish culture; fish taxonomy and fish bio-assays related to pollution problems.

The project is expected to be completed in 1977, $1 million is the estimated cost of the Canadian share of assistance (While the Thai Government's contribution to the project is estimated at 20 million Baht).

The Canadian share of costs is roughly divided as follows: -

Laboratory, Equipment	$350,000	
Training	250,000	
Experts	400,000	(mainly DOE Fisheries)

Responsibilities of Canadian and Thailand Governments

Canada

On this project the Government of Canada is mainly responsible for: -

- providing and bearing the costs of the experts for the project up to a limit of 9 man-years of long-term experts and 3 man-years of short-term experts. Exact field of expertise is decided during the annual project reviews;

- bearing the normal costs of the training of "Thai counterpart" staff from NIFI of practical training;

- contracting with Fisheries Research Board of Canada to administer the project through appointment of a Canadian Project Director.

Administrative Responsibilities of DOE

CIDA as the leading Canadian aid agency, has on behalf of the Government, negotiated an agreement with Fisheries and Marine Service of the Department of Environment, Canada. The agreement calls for the DOE to provide the professional, technical and other services to CIDA which would include: -

i) secondment of long-term (over six months) Canadian experts for up to 108 man-months; and short-term experts (less than six months) for up to 36 man-months;

ii) appointment of a Canadian Project Director who, as chief executive officer for the project, would be "responsible to" the DOE for its implementation. He is to be assisted by a Canadian Team leader in the field, selected from the long-term experts;

iii) assistance in the placement of selected Thai personnel for academic and on the job training at appropriate centres in Canada;

iv) preparation, for the review and consideration of CIDA and the Government of Thailand, of a yearly project report regarding the program and effectiveness of the project, problems encountered and corrective action taken or required to be taken.

Thailand

The Royal Thai Government's major responsibilities in this arrangement include: -

a) setting up the organizational structure of NIFI by consolidating existing inland fisheries research related units under a single Director, who would become the Director, National Inland Fisheries Institute;

b) providing the necessary land, construction of the building complex and associated laboratories, and set the experimental and research facilities;

c) appointment of a Project Director who will be the Thai counterpart staff for all the Canadian experts;

d) to provide as required qualified counterpart staff for all the Canadian experts.

Training Program

Since the inception of the project, its training program component has been most effective. The Natural Resource Institute at the University of Manitoba has been used for imparting long-term training through M.S. and Ph.D. programs. For short-term training programs, usually 3 to 4 months duration, the Thai trainees have been working at the Pacific Biological Station, Nanaimo and the Freshwater Institute, Winnipeg. They are gaining experience in areas like hatchery techniques, practical methods of plankton analysis, etc. Most of the Thai personnel in Canada are of intermediate or senior level ranks who "on their return are expected to have significant influence on the direction of NIFI."

Experts

On the Canadian side, two long-term Canadian experts have been to Thailand. While located at NIFI, they, in association with NIFI Director have familiarized themselves with the various Thai fisheries programs and problems. Their program of work with specific reference to research in fisheries management has included: an assessment of potential suitable habitats for rainbow trout; provision of assistance in the development of procedures for small swamp management and assistance in the evaluation of pond aerators in pond management.

(Short-terms exchange on the Canadian side has included visits of university professors supervising Thai students in Canada).

Problems

Administrative problems have arisen on the Thailand side on account of delays in setting up the NIFI laboratories in the new complex, and also due to slow pace of reorganization of Thai Inland Fisheries Division. Due to these delays which have resulted in a slow start, only five of the allocated 12 Canadian man-years, have so far been utilized.

On the Canadian side, the problems of satisfactory project evaluation are being emphasized. As CIDA's main concern is not research but the benefits acquired from a research project, it has asked the DOE Fisheries' Project Director to provide a new evaluation report. This report is to address itself to the impact and contribution of the project in upgrading the management of fisheries resources in Thailand. CIDA has also asked DOE for more frequent progress reports, on quarterly basis.

DOE has been reimbursed the salaries for its expert staff in Thailand by CIDA. While in Canada, $15,000 per year is allocated for administration overhead. However, there is no system of recognition (recompensation or allowance) for the time spent by the Canadian Director on design and coordination of the project. (Overall man-year replacement problems of DOE are no different from other departments).

Senior management is involved in the signing of international agreements, but the project per se is not part and parcel of DOE's program activities. Except for the International Liaison and Coordination Branch of DOE, there is not significant involvement of policy, program or finance divisions of DOE in the project.

II. CDA - INDIA DRYLANDS AGRICULTURE

The main purpose of this project is to increase agricultural production in dryland (i.e. non-irrigated) areas of India by developing dryland farming practices appropriate to Indian conditions and devising means of transferring these practices to dryland farmers. The object is to develop techniques for conserving surface moisture and for more effective use of fertilizers, and the selection and adaptation of plant varieties better suited to particular soil conditions.

Canada's involvement in India drylands agriculture stems from the recommendations of the CAFTI (Canadian Agricultural Task Force to India). The two-men agricultural scientist task force in close consultation with Indian agricultural scientists identified in 1967/68 several priority areas of need because of their relevance to Canadian capabilities. Accordingly, an Indo-Canadian Agreement was signed in August 1970 for 5 years, subsequently extended up to March 31, 1976, with a total contribution of 1.9 million dollars.

Because of its successful involvement in Phase I of the project, the Government of Canada has decided to continue its support in Phase II, already sanctioned by the Indian Government in its Fifth Five-Year Plan. The Canadian contribution during 1975-1980 is expected to be 1.63 million dollars.

Canada's Department of Agriculture (CDA) is designated as the agency responsible for developing and conducting the project in cooperation with the Indian Council ~~for~~ & Agricultural Research (ICAR). The Director of Lethbridge Agriculture Station in Alberta has been given principal responsibility for administering the project on behalf of Canada. It was felt that experience and expertise gained in Western Canada would be particularly relevant and transferable to Indian conditions.

Phase I (1970-75)

During 1970-75, eight Canadian experts, mainly from CDA's Research Branch, participated in the project. These experts with differing backgrounds came from various research stations within the Department's Research Branch.

During the first phase, Canadian and Indian scientists working through a network of 15 main research stations and 8 sub-stations, coordinated by a cell in Hyderabad, India, undertook research into key issue areas related to dryland farming: moisture, conservation, crop selection, weed control, input types and mixes, crop rotation and planting schedules.

An overall assessment of the project in 1974 showed that: -

- Under trial conditions, application of research results led to yields up to 250 per cent of those achieved through traditional farming methods.

- Sufficient technical progress had been achieved to justify continued agronomic research as well as experimentation to develop practices applicable to small, low income farms.

Comments: Phase I

India, from the inception of the project, maintained that collaborative effort should be on a 'partnership' basis rather than 'donor'/'recipient' relationship. The Canadian Project Director stated that the Indian scientists working on the project were of a high quality, and were familiar with the principles of agricultural research; CDA counterparts on the other hand were more familiar with new technology. The Indian experts on exchange visit to Canada were not required to take any specific course oriented academic or technical training; but needed "to benefit from our research experience." In these exchanges, the aim was to bring closer the scientists in Canada and India who were working in related areas. However, no explicit research project were undertaken within CDA to support the program.

Phase II (1976-80)

Phase II of the Drylands project corresponds with India's Fifth Plan period, under which the Project is programmed to intensify efforts as given below:-

a) Operational research projects on complete watershed basis at 4 locations, are to be executed for obtaining economic evaluation and credit-worthiness of the proven dryland practices while demonstrating methods for quick transfer of available technology under scientists' supervision.

b) An Agricultural training centre is to be set up for early dissemination of dryland technology at the Project Headquarters, Hyderabad, India.

c) Engineering research is to be carried out to develop time-saving implements, and devices for land preparation, moisture conservation, tillage, seeding, interculture, runoff recycling, efficient methods of crop-life saving irrigation and minimal irrigation.

d) Efforts to be made to develop more efficient rain-fed crop husbandry and cropping systems, including oil-seeds, grain legumes, tuber crops, grasses and fodder crops to meet the challenges of aberrant weather.

e) Alternate or multiple land use systems to be developed and evaluated on watershed basis for efficient resource management.

Administering Agencies

The Executing Agency of the Government of India on the project will again be the Indian Council of Agricultural Research (ICAR) and the executing Agency of the Government of Canada will be the Research Branch of Agriculture Canada.

Participation and Contribution by the Government of Canada

Canada's participation will be mainly in "operational research" and "training projects" in India and evolving "cooperative research" programs in Canada. It will consist of the assignment of personnel, the provision of field and laboratory equipment and supplies, and will cover the costs of international and internal travel of Canadian Advisors. It will also cover the costs of operation and maintenance of imported Canadian project vehicles, facilities for cooperative research in Canada, and the international travel and subsistence of Indian personnel selected for international visits and cooperative research projects. Canada, through CIDA and CDA will provide:-

a) Professional personnel: a team of Canadian advisors in such fields as agronomy, soil science, plant science, agricultural engineering, and others mutually agreed upon for research up to a total of about 144 man-months.

b) Non-agricultural personnel: Canada will select maintenance, administrative and architectural personnel as mutually agreed upon for operation of the project to at total of 24 man-months.

c) Equipment and supplies: vehicles, equipment, spare parts, and supplies, including fertilizer and agricultural chemicals for the research, the operational research, and the training projects to a maximum value of $600,000.

d) Cooperative Research: the facilities, including land, laboratory supplies, equipment, professional guidance, and technical support for cooperative research projects conducted at Canadian research stations (24 man-months).

The Project Director and Canadian Principal Advisor will both submit recommendations annually on the projects suitable for cooperative research on the basis of which applications will be invited from the Indian Project personnel. Canadian and Indian participants in Cooperative Research Projects will be selected by the two Executing Agencies in accordance with the needs of the Programme.

Participation and Contribution by the Government of India

The Government of India is mainly to provide the following:-

a) Dryland Research Project

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Continued operation and maintenance expenditures for the Coordinating Center and all designated Dryland Research Centers including miscellaneous supplies, services, technical equipment, that are locally available; staff travel operational funds are to be provided on a differential scale to Research Centers on the basis of the extent of their program and the success of their operation.

b) Professional Personnel

Professional personnel trained in different specialities as required for the effective working of the research, operational research, and training programs at the Coordinating Center and at all other designated centers.

c) Cooperative Research and Third Country Visits

Indian personnel selected will be on deputation as per the Government of India rules. The Indian Executing Agency will bear costs on salary and international travel.

d) Working Accommodation

Adequate working accommodation for all staff, Canadian and Indian, engaged on the Project.

Planning and Annual Programme of Work

The annual programmes for research will be developed by scientists at the individual centers in India in view of the agricultural problems in their area and the needs of the local agricultural industry. Coordinating staff comprising both Canadian and Indian scientists will visit each center periodically to discuss problems, assist in the planning of research and demonstrations, and to evaluate progress

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towards the objectives of each center. Scientists will participate in workshops or mini-workshops and seminars periodically to discuss research results and to formulate recommendations for testing at the Operational Research Centers and for release to the public.

The curriculum for Training Center (India) will be developed on the basis of recommended technological practices and will be updated as new practices become available. Training will be imparted through lectures, demonstrations and field projects.

Shared Participation by the Government of Canada and the Government of India

Costs of Indian staff, vehicles, equipment, supplies, land treatment, operation, maintenance, travel and contingencies for the Operational Research and Training Projects will be shared as follows:

	1976-77	1977-78	1978-79	1979-80
Govt. of India	Nil	33-1/3%	66-2/3%	100%
Govt. of Canada	100%	66-2/3%	33-1/3%	Nil

Disbursement of Canadian funds will be made as and when senior Indian staff are in position.

Costs of the buildings at the Coordinating Center including office, laboratory, classroom, hostel, and maintenance facilities, and the cost of maintenance and storage facilities as may be required at the Operational Research sites, all exclusive of land charges, will be shared as follows: -

Government of India: 25%
Government of Canada: 75% up to a limit of $850,000.

The development of building plans and estimates will be effected by the ICAR in conjunction with the Canadian Executing Agency.

CIDA/CDA

Salient features of CIDA's agreement with the Canada Department of Agriculture on this project include:-

- provision of a team of Canadian scientists, engineers and agrologists (agronomes) as required for the effective operation of the program under a Canadian Project Director. He will be assisted in the field by a Canadian Principal Adviser.

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- provision of facilities and staff in Canada for cooperative research projects of mutual benefit to Canada and India. This will involve selection and recommendation of appropriate cooperative research in Canada and international study tours.

- selection, purchase and shipment of support and research materials and equipment, as agreed to by CIDA, for the program.

- submission of progress reports regarding the effectiveness of the program which will be prepared in conjunction with Projects' Coordinating and Steering Committees.

Cooperative Research

The project has new concepts of "cooperative research" and "shared management" incorporated into it. The Project Director commenting on the possibilities of cooperative research identified three areas:-

- exchange of genetic material and its testing;

- problems of crops common to both the countries (e.g. sunflower/oilseed); and

- exchange of research information.

It should be pointed out however that of $1,170,000 allocation of the project, only $40,000 has been provided over a 5-year period for cooperative research.

A rough division of allocated Canadian spending for Phase II shows $340,000 to provide laboratory equipment and spares; and $830,000 for experts, cooperative research and international visits. In addition, there is some 'Canadian Rupee Expenditure' involvement; Rs. 6,445,000 ($1,290,000 Canadian) which covers payments for the Headquarters building, operation and maintenance of Canadian vehicles and internal travel of three Canadian experts.

CDA's Concern

CDA officials stated that recruiting was one of the vital and difficult aspects of operating overseas aid projects. A great deal of time and effort was spent attracting qualified, experienced, interested and adaptable staff to projects. At the same time, there were no career advantages for scientists to go on overseas assignments as no compensation for career disruptions was made and no explicit recognition was accorded to accomplishments abroad.

III. CCRS-PERU REMOTE SENSING ORGANIZATION PROJECT

Purpose

CCRS-Peru project intends to simulate a laboratory model in Canada for the Peruvian remote sensing organization, utilizing the CCRS facilities and the Peruvian exchange scientists. This cooperative effort is to be directed toward the development of a functional and justifiable labortory design and the purchase of the equipment which are mutually considered as necessary and practical in the Peruvian context. As one would note, the acquisition of equipment has been integrated in the program as a research problem in itself.

Cooperative Program Development and Management

The project has been based on the notion of shared responsibilities for program development and management in recognition of existing Peruvian expertise. Operational management of the project activities in Canada are to be undertaken as a cooperative responsibility. CCRS's counterpart organizations in Peru, ONERN (National Office for Evaluation of National Resources and IGP (Peruvian Geophysical Institute) who are responsible for sending their scientists to Canada have also agreed to appointing a Peruvian Project Coordinator in Canada. He, a Peruvian scientist, will hold responsibilities in Canada in all areas of the project.

Program

In order to ensure that maximum benefit is obtained during each scientist's three-month program of activities in Canada, each visiting expert will be required to prepare and submit for approval, a personal, problem-oriented research proposal. Each proposal will be reviewed in terms of the suitability of remote sensing techniques and Canadian capabilities prior to the participant's arrival in Canada.

The Peruvian Coordinator will be responsible for ensuring that the individual proposals would contribute to an integrated program, and that all necessary preparatory follow-up work is accomplished by the individuals. Support work in Peru will be carried out under the supervision of the Project Director. The continuity of program thus provided should serve to broaden the exposure and involvement beyond the limited number of specialists who will come to work at CCRS.

On the Canadian side, CCRS's Application Development Unit feels that such involvement will contribute to the understanding of problems of design, capacity transfer and technology application. The model developed and tested at CCRS can be useful to us in improving our methodologies and design in related areas.

The Canadian share of the project is currently estimated to be $600,000, of which $400,000 will be spent on paying for visiting Peruvian scientists, CCRS and other Canadian technical advisers. The remaining $200,000 will be spent on the purchase of appropriate equipment. (Peruvian contribution is mainly for work to be done in Peru). Choosing of equipment is a critical factor. The model-simulation at CCRS will help Peruvians make that technology-choice decision.

Two committees have been proposed: -

i) a steering committee comprising a Peru official, a CIDA project officer and a CCRS coordinator to oversee the progress of the project and its evaluation; and

ii) a Policy Committee comprising Canadian and Peruvian staff members of Director level for discussions on policy matters with regards to the project.

It should be pointed out that the nature of this project is such that there is a very little involvement of Canadian experts in Peru. Most of the $400,000 spending, because of the location of CCRS is in Canada.

Reimbursements

The Project involves 15 man-months of Peruvian staff over a 2-year period in Canada. CCRS will be reimbursed by CIDA for all the costs incurred in Canada (which is an exception to the rule).

In-house Problems

The Canadian Project Coordinator summarized the 'in-house' problems with respect to LDCs under three broad categories: -

- Diversion from one's own research work.
- Risk of project failure and lack of recognition
- No encouragement to develop interests in LDCs due to lack of an international mandate.

(At this stage, CCRS-Peru is awaiting approval of Peruvian government; formal agreements between Canada and Peru and CIDA and CCRS are not yet available).

CONCLUSIONS

Scope

A multi-level approach to twinning: bilateral, regional and international is in general lacking in federal technical assistance programs. The foregoing case studies have been essentially of a bilateral nature. These project examples of near 'twin' arrangements between a federal science-based research organization and a parallel organization in a developing country, in spite of their bilateral type orientations, cover a wide spectrum of twinning type activities: institution building (NIFI); research know-how exchange (India Drylands Agriculture); and technology-transfer (CCRS-Peru).

The India Drylands Agriculture and the CCRS-Peru projects explicitly aim at adaptation of Canadian know-how to the Indian and Peruvian conditions respectively. In the India Drylands, the effort has been made to advise as well as evolve a cooperative research effort; in the case of CCRS-Peru project operational type research is being undertaken in Canada in conjunction with Peruvian scientists to make technology-choice decisions in the context of the developing country. The latter project shows the scope provided to an LDC to "unpackage" the aid possibilities and select the components that country requires. Emphasis of the NIFI Thailand project, on the other hand, is on modernizing fisheries resource management and the building up of related research management structures.

Approach and Principles

The three studies suggest the following broad pattern of current arrangements between CIDA and Departments. At the request of a developing country, CIDA initiates a review of the project application. In association with CIDA's Special Advisor's Branch, effective submissions are prepared for CIDA's project review committee with an estimate of need of equipment and personnel. Appropriate executing agencies for the project are sought in the university, industry and government sectors. The government departments are generally asked to provide advice and services related to feasibility and on-site studies and with regard to applications of certain know-how to developing countries.

Departments, in recent years, have sought to negotiate two types of agreements with CIDA: a general umbrella agreement stating the scope of department's involvement in CIDA activities, and specific project agreements underlining the role and responsibilities of the staff assigned on a project. However, in both

the types, cooperative research and shared responsibilities for program development and its management have been generally implicit.

Of the three case studies, in the India-Drylands Agriculture project, Phase II, the cooperative research constitutes less than 5% of the total Canadian program effort. In the case of CCRS-Peru project, CCRS has taken a lead in evolving a joint approach to the program development recognizing the potential mutual benefits. An explicit common set of criteria used for the selection and an assessment of appropriateness of such projects is generally missing.

Departmental Involvement

The impact of CIDA-Federal Department agreements on departments is marginal. It has not led to any building of a sustained 'in-house' R&D capacity in selected areas relevant to Developing countries.

In the role of contractor for CIDA, the departmental initiative has tended to be very weak. It has been confined to the supply of short- and long-term experts to LDCs, and the training of LDC personnel in government research establishments. In general, instead of being 'initiators', Departments have been essentially respondents to CIDA's requests. It is rare to see a department attempting to link its overseas involvement with its internal activities, even in such minor ways as asking the seconded expert to report his professional accomplishments abroad and be recognized by his peers and seniors for these accomplishments.

In summation, the three case studies, successful as they are in terms of their twinning aspirations, nevertheless point out the boundary conditions under which these programs have evolved in recent years.

Firstly, longer-term (more than 5 years) commitments are difficult to make. A successful five-year phase might lead to further technical cooperation. India Drylands Project Phase II, suggests an alternative approach in this direction.

Secondly, a joint cooperative research effort has been the exception rather than a frequent occurrence in the technical assistance programs; and even where it has been introduced, it has comprised a minor component of the total program.

Thirdly, no research is undertaken in federal research establishments directed towards the problems of the Third World either in general terms or as a specific priority concern to the developing partner. In this regard, inadequate systems exist within the departments to accumulate and utilize the knowledge obtained through professional accomplishments abroad.

Fourthly, mutual benefits, anticipated or accomplished, are not identified.

Finally, although senior management is involved in the signing of international agreements; the projects are not always part and parcel of departmental program activities. Except for the international liaison unit of a department, there is no significant involvement of the policy, program or finance divisions of participating departments in the three projects.

SECTION II - SCIENTIFIC COOPERATION EFFORTS IN SELECTED OECD COUNTRIES

SECTION II - SCIENTIFIC COOPERATION EFFORTS IN SELECTED OECD COUNTRIES

The major purpose of this section is to provide brief accounts of the approaches of selected OECD countries to scientific cooperation with developing countries, (LDCs). The UNESCO Report on Bilateral Institutional Links in Science and Technology in 1969 identified about 500 linkages between a developed country institute and a developing country institute. These linkages, however, although covering both public and private sectors dealt mainly with the universities.

In this study, a general idea of current major policy thrusts of the OECD countries in the areas of scientific cooperation is presented. In the few cases where information was available with regard to specific governmental 'R&D twins',[1] an examination of the policy thrusts in this areas has been also attempted.

The interest of a majority of the developed countries in collaborating with developing countries in the area of scientific research is a recent one. Britain and France, and to a lesser extent, the Netherlands are notable exceptions which because of their historical links with their former colonies have maintained well nurtured interactions and joint programs with LDC scientific establishments. Other developed countries, including the U.S., have only recently begun to evolve a coordinated institutionalized approach towards joint scientific endeavours.

Until very recently, a large part of the developed countries' efforts were limited in general to either building institutions which could utilize new technologies or to the training of related technical personnel. Self-management and development of an indigenous R&D capability was usually considered as a low priority in technical assistance programs.[2]

In the following pages, the priority concerns of seven major OECD countries for cooperative effort in scientific research directed towards solving the problems of developing countries, are examined briefly. While describing their governmental policy stances in this area, the mechanisms and principal criteria of their joint scientific endeavour with developing countries are identified.

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[1] Twinning should be understood here in the context of the R&D twinning arrangement developed in Section III of Volume I.

[2] Following two works provide an excellent overview of the subject: UNESCO, Bilateral Institutional Links in Science and Technology, Science Policy Studies and Documents No. 13, Paris 1969, pp. 31-70.
Rufo, Giovanni, Science et technologies au Service du Tiers Monde, Science Policy Research Unit, Univ. of Sussex, 1976.

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I. BRITAIN

The Ministry of Overseas Development in the U.K. undertakes research and development (R&D) in many fields on behalf of developing countries as well as together with them. The Ministry, through a network of its own research establishments within the government and the private sector, often supports research on its own initiative rather than in response to specific requests. Such research is directed towards problems that affect groups of developing countries or the developing world as a whole. It has four components:-

i) Research projects carried out on a contract basis by individual researchers or teams, usually based on universities or similar institutions.

ii) Support to British scientific establishments, mostly governmental.

iii) Support to international research centres undertaking R&D on the problems of developing countries.

iv) R&D carried out as part of Britain's aid to particular countries.

Aim and Criteria

The aim of the R&D supported by the U.K.'s Ministry of Overseas Development is in general, "the greater well-being of people in developing countries - and in particular the poorest people in the poorest countries." A special priority is now given to R&D of direct relevance to the attack on individual poverty, and in particular rural poverty in developing countries.

The Ministry applies two basic criteria for deciding whether to support a research project.[3]

i) The work must be directed to gathering new knowledge on developing new techniques directly related to the needs of developing countries.

ii) The knowledge on techniques concerned should be capable of practical application within a reasonably limited period.

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3 Ministry of Overseas Development, Report on Research and Development, 1975, Her Majesty's Stationery Office, London, 1975.

In line with the "customer contractor" approach to R&D which has been implemented by the British government since the recommendations of the Rothschild Commission on R&D, the Overseas Development Ministry interprets to its research 'contractors' the needs of its overseas 'customers' and commissions work on their behalf through a system of subject/field oriented advisory research committees, panels and boards. The responsibility of ultimate decisions rests with the Ministry's staff (which includes professional advisers in many disciplines) working in consultation with overseas governments and institutions and appropriate specialists in Britain.

Many of the Ministry's research requirements on behalf of the developing countries can be met by engaging researchers in universities or other institutions in Britain on a contract basis for individual research projects. There are however certain specialized fields in which R&D adequate to overseas needs is carried out in 'centres of expertise' in Britain to which the Ministry provides financial support on a long-term basis (See Appendix - A). They include special units of the Ministry of Overseas Development, units of other government departments and other governmental bodies. Following is the list of institutions to which the Ministry of Overseas Development in the recent past hs provided long-term support.

A. Special Units of the Ministry of Overseas Development

i) Tropical Products Institute
ii) Centre for Overseas Pest Research

B. Units of other Government Departments

i) Overseas Unit of the Transport and Road Research Laboratory
ii) Overseas Division of the Building Research Establishment
iii) Overseas Unit of the Hydraulics Research Stations
iv) Overseas Division of the Institute of Geological Science

C. Other Institutions

i) The Centre for Tropical Veterinary Medicine
ii) Overseas Department of National Institute of Agriculture Engineering
iii) Commonwealth Forestry Institute
iv) Industrial Liaison Unit, Intermediate Technology Development Group

An examination of the R&D performed by these British institutions, receiving long-term support, showed that a total of 237 projects directed to specific LDC problem-areas[4] were carried out in 1975. Of these, 15% were identified to have a LDC partner. (See Appendix-B). A majority of the projects were of short-term nature, less than five years, although most of the institutions identified LDC research programs of long-term duration. These programs included: a study of locust flight, chemical control of locusts, use of insecticides and pesticides, crop loss economics, biology of termites, development of animal drawn equipment, fresh water fish, research on hard fibres, fast growing tropical tree species and the use of composite flour in making of bread and manufacture of non-bread baked foods.

II. FRANCE

Scientific and technical assistance provided by France has been concentrated largely on the countries formerly ruled by her, especially those in Africa. Assistance in relation to scientific research has been in the forefront of technical aid programs of France. France, like Britain, has a wide network of research establishments within and outside the government which were created during the colonial period. They continue to receive governmental support. Three organizations dealing with overseas scientific research are discussed below.

ORSTOM: Office de la Recherche Scientifique et Technique Outre-mer

ORSTOM mainly deals with fundamental research related to tropical plants and animal production. Its mandate is to "undertake and develop outside of temperate zones basic research oriented towards vegetal and animal productions, and towards the establishment of basic data on natural and human environment", and "in these zones, to establish an infrastructure allowing for basic research in all fields".

With its headquarters in Paris, ORSTOM has an extensive infrastructure of research laboratories. In France, its central laboratories cover about 17 subject-areas, while there are 35 ORSTOM 'Missions' and 'Centres' in foreign territories, 29 by themselves in Africa. The subject-areas covered by ORSTOM research establishments include: geology, hydrology, pedology, botany, zoology, medicinal plants and medical pathology.[5]

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[4] Ibid

[5] Office de la Recherche Scientifique et Outre-Mer (ORSTOM), Rapport d'Activities, 1972-73.

All ORSTOM stations, whether on French territory or elsewhere, are mainly 95% financed by France, the remainder being grants from African nation-States. Its staff counts a little more than 1,300 members, with 550 researchers, 300 technical and approximately 1,300 'local' officers outside France.

To provide two major kinds of technical assistance: scientific research and the training of overseas personnel, ORSTOM has around $50 million annual budget.

GERDAT: Groupement d'étude et de recherches pour le développement de l'agronomie tropicale

GERDAT was created in 1970 to group and coordinate the activities of 8 institutes of applied agronomical research in tropical countries, established between 1942 and 1969. They include: -

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- Institute of Research on Cotton and Exotic Textiles (IRCS): Institut de recherches du coton et des textiles exotiques (IRCT)
- Institute of Research on Oils and Oilseeds (IRHO); Institut de recherches pour les huiles de palme et oléagineux
- French Institute for Fruit Research Overseas (IFAC); Institut des fruits et agrumes coloniaux
- Technical Centre for Tropical Forestry (CTFT); Centre technique forestier tropical
- Research Institute for African Rubber (IRCA); Institut de recherches sur le caoutchouc en Afrique
- French Institute for Coffee, Cocoa and other stimulants (IFCC); Institut français du café, du cacao et d'autres plantes stimulantes
- Institute for Tropical Agronomical Research and food cultures (IRAT). Institut de recherches agronomiques tropicales et des cultures vivrières

GERDAT also has an Experimental Centre on Tropical Agriculture Equipment (CEEMAT). Centre d'Etudes et d'Expérimentation du machinisme agricole tropical

In general, the GERDAT has been given following three main responsibilities: -

i) to help define the main orientations of the French research policies on tropical agronomy in view of the goals of the developing countries;

ii) to maintain a close and permanent contact with other research organizations and develop contacts with other developmental organizations; and

iii) to evaluate the funding requirements, program, and coordinate the work of all institutes in order to increase the efficiency of individual research units.

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The Organization, to fulfill its mandate, uses three types of mechanisms: -

i) activities with general or regional interest, entirely funded by France;

ii) expenditure for 'traditional' programs are generally shared on 50% - 50% basis;

iii) a third type of agreement, essentially based upon British pattern, is now adopted where France covers the cost of research and the developing country finances the remainder of the project cost.

A total of 900 persons are employed by the GERDAT, including 600 researchers and approximately 15,000 'local' employees.

Pasteur Institutes

The overseas Pasteur Institutes were established only three years after the creation of the Pasteur Institute (PI) in Paris in 1891. Today, they number about 20 and fall into three main types of organization. The first, to which belong the Pasteur Institutes in overseas territories (Guyana, Martinique, Guadeloupe, New Caledonia), depend directly upon the Paris Institute for administration and funding; the second, comprising the subsidiary offices of the Pasteur Institute (Athens, Dakar, Bangui, Pnom-Penh and Tananarive) are semi-autonomous; and the third which includes the National PIs in Algérie, Abidjan, Casablanca, Saigon, Tehran and Tunis are the responsibility of their own governments. The conventions of the latter mention only a moral and scientific link with The Pasteur Institute in Paris.

In addition to preparation of biological products (vaccines and serums) and the training of researchers, the Institutes are involved in R&D activities in the fields of parasitology, bacteriology and viriology.

With such a wide infrastructure of R&D at home and abroad, one of the major problems of French government has been the effective coordination and provision of a national focus in this area. In 1971, the Government constituted a 'Working Group' - the Commission Bergerard - to conduct an inventory of French research overseas. The Commission suggested that for a general coordination of all activities related to the R&D pertaining to the Third World, a Coordinating Committee for Overseas Research (CCROM) be formed. In the Government's Plan VII, the paper on the scientific orientations highlights the governmental intention to create

délégation générale à la recherche scientifique et technique

a coordinating agency, affiliated to the DGRST, supported by a scientific council, and operating in conjunction with interested departments. This body will have the major objective of developing programs taking into account both the goals of the scientific and technical policy and the requests of the developing countries.

The French allocation of financial resources for R&D activities for the developing countries for the year 1976 was recently estimated in an unofficial report, to be at 430 million francs, the biggest recipients were ORSTOM (38% - 164 Mf) and GERDAT (26% - 110 mf).[6]

UNITED STATES

Agence int. de dév.

The Agency for International Development (AID) administers a program of technical assistance. A large part of this effort is, however, directed toward building institutions that can absorb and utilize new technologies, and evaluate the efforts of governments and organizations working on development problems, especially with regard to strengthening of the LDC infrastructure.

In 1969, the Office of Science and Technology was established within AID's Bureau for Technical Assistance to coordinate research, training and information project activities within the government, industry and university sectors. Scientific assistance to developing countries within the federal sector is also provided by the National Science Foundation and departments like Commerce, Defence, Agriculture, Interior, and the Energy Research and Development Agency (ERDA).

Although the Office of Science and Technology has been preoccupied with problems of effective technology transfer initiatives, cooperative scientific research projects have been rare. One official report commenting on the new interest in this subject area states: -

> "Transfer of rsearch may take place by means of a cooperative project in the U.S. or abroad, or by a project established in an LDC for local operation. One future problem, especially in dealing with countries becoming more developed, is to establish or bolster the mechanism which aids in the selection of projects of particular interest to the LDC."[7]

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[6] Rufo, Giovanni, op.cit., University of Sussex.

[7] Department of State, International Science Notes, No. 34, Washington, June 1975.

It goes on to suggest that such cooperative efforts require that specific needs are identified and assembled by subject-area; and that needs are reviewed in terms of possible solution by the most qualified more developed countries.

At present, the U.S. is cooperating in research with 17 countries, both developed and developing, under broad intergovernmental agreements. In addition, it has a number of agreements and Memoranda of Understanding between U.S. governmental agencies and their counterparts in other countries covering a wide spectrum of scientific activities.

III. NETHERLANDS

The Netherlands, like France and the U.K., has also benefitted from its colonial history, and the scientific research institutions which were created during that period.

Of these, the Royal Institute for Tropical Regions (Koninklijk Institut noor de Tropen) of Amsterdam, created in 1910, is a private foundation which today is financed for up to 80% by public sources. It specializes in anthropology, agronomical research and tropical health. It has established a medical research centre in Nairobi, and has affiliated services such as the Tropical Museum and the Central Office for the training of researchers. It employs more than 200 persons, including 120 scientists.

The most significant initiatives in cooperative scientific research however have come from the Dutch Central Organization of Applied Scientific Research (TNO). It consists of about 50 institutes, a large majority (24) of which deal with industrial research. TNO has a 'Bureau for International Projects' which coordinates the organization's activities in two main areas.[8]

a) short-term missions to developing countries to carry out feasibility studies; to advise on organizational, economic and technical aspects with regard to R&D and its application; technical information; and

b) medium-long-term and long-term projects to stimulate technological knowledge and its implementation in developing countries.

The TNO's research linkage projects are grouped into two categories: -

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[8] Institute of Central Organization for Applied Scientific Research in the Netherlands, An Information Booklet, The Hague, Netherlands.

i) those which are aimed at the transfer of technology; and

ii) those aimed at research development for developing countries.

For the past four years, TNO institutes have been involved in such research 'twins' with several LDCs, examples being a new building materials project in Kenya and Indonesia; ground water investigations with Iraq and Sudan; and jute processing technology in India. In 1975, the Organization anticipated a Netherlands expenditure of Nfl. 500,000 (U.S. $200,000) for industrial applied research for developing countries. This was in addition to the funds already allocated to agriculture research for developing countries. In a report entitled, 5 Years of Technical Assistance, 1972-77,[9] TNO identifies nine projects in which Twinning arrangements have been successfully made with research institutes in developing countries. These R&D twins cover subject-areas like "Development of Bakery Products from Composite Flours"; "Soya-Bean Proteins for Human Consumption"; "Glass Research"; "Appropriate Technology"; "Textile Technology"; and "Technical Information Services".

Project Selection Criteria

The criteria applied for the selection of projects under the Netherlands research program for developing countries include: -

- the research proposed must aim at elimination of bottlenecks in the economic progress and social development of large groups of the population or at a better evaluation of existing needs.

- the subject of the research must be of a general nature and not merely be related to an incidental or locally restricted problem.

- commitments with regard to a research should be only undertaken if the project is clearly delineated and the aim, budget and duration have been agreed in advance.

- assurances are needed about how the results will be put to use.

- research in the developing countries should have priority over research anywhere else. Preferably, researchers from these countries should be involved.

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9 Central Organization for Applied Scientific Research in the Netherlands (TNO), Five Years of Technical Assistance in Africa, Asia & Latin America, July 1976.

- where the research is to be carried out in a developing country, the project must be requested or approved by the central government of that country.

In addition to the Royal Institute of Tropical Regions and the Central Organization of Scientific Applied Research (TNO), there are other bodies like the Foundation of Hydraulic Laboratories; Dutch Organization of Basic Research (ZWO) and its agency the Foundation of Scientific Studies on Tropical Zones (WOTRO) which deal with research interests of LDCs. In recent years, an effort has also been made to develop a National Council on Research for Underdeveloped Countries under the Department of Education and Science.

IV. FEDERAL REPUBLIC OF GERMANY

In early 1974, the Government of the Federal Republic of Germany adopted a series of new principles for technical cooperation which laid down the objectives, priorities, contributions and methods of cooperation with developing countries.[10]

The aim of technical cooperation is to support the developing countries in their own efforts to tap the resources and capabilities of their people. Priority is given to the economic and social integration of backward rural areas.

The FRG Ministry of Economic Cooperation (BMZ) was formed 14 years ago to provide technical and financial aid to developing countries. In April 1976, to develop an integrated approach to technological developments for, and technology transfer to, developing countries a working arrangement was made between the Ministry of Economic Cooperation (BMZ) and the federal Ministry for Research and Technology (BMFT).[11]

The arrangement is that the BMZ identifies problem-areas and allocates funds, and BMFT plans and directs the program aimed at problem solution.

BMFT, however, has no in-house research capability. Virtually all of its 1.6 billion dollars per year are used for contracting R&D, this is also true in the case of money allocated by BMZ to aid developing countries. The contracts may go to very large firms or to small, highly specialized firms.

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[10] Federal Ministry for Economic Cooperation, Report on the Development Policy of the Federal Government: Development Policy Concept, Bonn. 1975.

[11] Press Release of the Text of the Agreement between FRG's Federal Ministry of Economic Cooperation and the Federal Ministry of Research and Technology, Bonn, April 1976.

Scope of 1976 Agreement

The April 1976 agreement between the BMFT and BMZ provides for the Federal Ministry for Resarch and Technology (BMFT) to assist in the following types of R&D projects which aim at the technical solution of a problem occurring in developing countries.

Type A

Development of new, labour-intensive technologies in accordance with conditions in developing countries; adaption of traditional technologies in developing countries. (Example: techniques for low-cost building in developing countries).

Type B

Transfer of technologies which are available in the Federal Republic to developing countries and technological adaptation in developing countries. (Example: conditioning of water by using solar-heated heat pipes).

Type C

Development in Germany of available technologies to meet requirements in developing countries. (Example: installations for desalinization of sea water).

Type D

Development within Germany of new technologies in accordance with conditions in developing countries. (Example: cement plants for small markets).

The BMZ Ministry of Economic Cooperation is interested in those technological problems which appear not only in one but in several developing countries. Also in assessing a potential project the Ministry takes into consideration the priorities set up by the UNESCO and the DAC planning group, and the experience gained by foreign counsellors.

BMZ spent approximately 10 million DM (4 million dollars) in 1975 on technical innovation pertaining to developing countries. By 1977, it is hoped the budget in this area will rise to 25 million DM.

The following list of the types of technical projects to developing countries shows the nature of German involvement in this area: -

- cheap building methods
- water processing from solar heat

- desalination unit for treating sea water
- building cement factories for limited markets
- isotope and radiation technology
- provision of small unsophisticated oceanographic research vessels
- small-scale nuclear reactors
- new technologies for coal refinement
- prospecting for mineral deposits
- communication satellites for teaching
- earth resources satellites to search for deposits of raw materials and pollution
- satellites for weather observation
- techniques of pest control
- agricultural technology

V. SWEDEN

The issue of Swedish support to development research was studied by a special Royal Commission appointed in April 1971. Its mandate included identification of objectives and proposals for organization of development research.

The Commission made a distinction between three different types of research: -

- development theory, which analyses the causes of underdevelopment in the prospective of processes of social change and international interdependence.
- surveying research, which provides the necessary information on the physical, medical, ecological and cultural environment.
- sectoral research, which deals with problems within different sectors important to the process of development.

Following, the Royal Commission recommendation, in July 1975, the Swedish Agency for Research Cooperation with Developing Countries (SAREC) was established.

Objective

SAREC's objectives are "to assist in the development and strengthening of a scientific and technological infrastructure in developing countries in order to lessen the dependence on developed countries and increase the capacity for establishment of economic and social justice."

Mandate

The mandate of the Agency is: -

- to advise the Swedish Government on the program of research financed from Swedish aid funds;
- to process research projects and programs up to the stage of decision by the Swedish International Development Authority, (SIDA) and the Government.
- to cooperate with SIDA and the national research councils;
- to initiate research projects and programs;
- to follow the programs of international organizations and institutions for science and technology in other countries.

Funds

A sum of 75 million Swedish Crowns ($18,700,000) were allocated for the fiscal year 1975-76. However, for that fiscal year, at least, 60 million crowns were already tied to existing multilateral research programs.[12]

Research Priorities

SAREC's program for 1975-76 involves planning of future work and decision on research priorities. They include: -

i) programs which contribute to increase the capacity in developing countries:

ii) projects of individual researchers in developing countries;

iii) international research programs - mainly those of the UN system; and

iv) projects of individual researchers in Sweden.

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[12] SAREC: Swedish Agency for Research Cooperation with Developing Countries, A General Information Brochure, 1976.

The main part of the research funds are spent on the first two categories.

VI. JAPAN

At present, research and development cooperation activities on a governmental basis in Japan are handled by several ministries. Major examples are the Tropical Agricultural Research Centre (TARC) and the Office of International Research and Cooperation.

TARC was established in 1970 by the Japanese Ministry of Agriculture and Forestry with the objective of assisting the development of tropic agricultural technology by carrying out research both in the Centre and in developing countries. Its main implementation strategy consists of the use of joint cooperative research programs with scientists of institutions in tropical and sub-tropical countries. All funding is provided by the Ministry of Agriculture and Forestry. 39 research projects with developing countries and international research centres have been initiated since the Centre's establishment.[13]

The Japanese Ministry of International Trade and Industry is responsile for the development of mining as well as industrial technologies. In 1973, it established, within its Agency for Industrial Science and Technology, an Office of International Research and Development Cooperation responsible for initiating "joint" research programs with developing countries in the mining and industrial fields. The Office applies four major criteria in the selection of the joint research and development programs: -

i) projects must be based on the genuine economic and social needs within developing countries;

ii) R&D activities must be carried out both in Japan and in a developing country on an equal basis;

iii) R&D activities must be carried out in close cooperation with developing countries taking their self-reliant aspirations into full consideration; and

iv) the successful outcome, if any, would be utilized mainly for the developing country concerned.

Scope of R&D Activities

So far Japan's ITIT projects (Institute for Transfer of Industrial Technology) have involved three phases:

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[13] Tropical Agriculture Research Centre (TARC), General Information, 1975, Tokyo, Japan.

i) sending fact-finding teams or researchers abroad to find possible joint research and development projects;

ii) holding meetings on R&D management with managerial researchers from developing countries; and

iii) carrying out the joint research and development projects.

In 1974, nine cooperative research projects were identified to be in operation which included domestic and overseas laboratory work, mainly involving governmental research institutes and laboratories in Japan and developing countries.[14] These joint projects which come very close to our earlier defined twinning criteria, dealt with R&D pertaining to subject areas such as: quality control of glassware; utilization of oil and fat resources; building material development using local mineral resources; characteristics of ceramic raw material; improvement of timber by plasticization and the manufacture of wood plastic composite materials etc.

The Office of International Research and Development Cooperation is generally involved in respect of its twinning operations in the following type of activities: -

- planning, programming and managing joint R&D projects;
- conducting joint R&D projects relating mainly to developing countries;
- carrying out joint R&D projects to create a new technology appropriate for a specific developing country or to improve an already existing technology to fit the local conditions;
- sending research engineers to developing countries for R&D activities abroad, and inviting research fellows from developing countries in Japan.
- inviting research managers to exchange views concerning joint R&D projects and to provide an opportunity to visit research institutions.
- sending experts and inviting trainees in close cooperation with Japan International Cooperation Agency (JICA);

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[14] Office of International Research and Development Cooperation, Progress Report of International Research and Development Cooperation: ITIT Projects, Volume I, Japan, March 1976.

- sending fact-finding teams abroad to find possible joint R&D projects;

- circulating and disseminating the results and experience of research and development activities to developing countries.

In 1976, Japanese financial involvement in the research based twinning arrangements via the Office of International Research and Development Cooperation was estimated to be around $444,000.[15]

CAMPARISON OF OECD COUNTRIES' EXPENDITURE ON R&D DIRECTED TOWARDS DEVELOPING COUNTRIES

Making international comparisons in the area of technical assistance is a hazardous exercise. It is even more so in the case of scientific research. At present, no standardized methodology exists within international organizations like OECD or UNESCO for the measurement of comparative international effort in this area. OECD had until the mid-sixties, an entry in its R&D survey questionnaire for the 'objective' or 'field of application' of the research. However, these terms were dropped because of a lack of consensus among member countries on the subject. Instead, we are using here the findings of the University of Sussex study on the subject.[16] For the year 1975, the Sussex study shows the following expenditure pattern among the OECD countries towards LDC research and development.

Expenditure Towards LDC R&D in Selected OECD Countries (1975)

Canada	2%	of Gross	National	Expenditure	on R&D
Sweden	2%	"	"	"	"
France	1.8%	"	"	"	"
United Kingdom	1.2%	"	"	"	"
Netherlands	1.0%	"	"	"	"
West Germany	0.6%	"	"	"	"
Japan	0.4%	"	"	"	"
U.S.	0.3%	"	"	"	"

[15] Ibid

[16] Ruffo, Giovanni, op.cit., University of Sussex

CONCLUSIONS

The foregoing examination of the efforts of the major industrialized countries in the area of S&T assistance shows an active interest among these nations towards evolving a newer approach to technology transfer and scientific cooperation with developing countries. This is more evident at the policy and institutional levels where most of the principles and criteria for assessing effectiveness of the technology-transfer suggest 'Twinning' as an essential component of their technical assistance strategies.

Recognition of a Need for Central Focus

Since 1969, all of the seven countries discussed earlier have been busily engaged in evolving institutional structures which would provide focus, direction and coordination of national scientific and technological activities directed to developing countries needs.

U.K., France and Netherlands have made use of their historical connections, reorganizing tropics oriented research establishments under umbrella organizations such as ORSTOM, GERDAT and the Ministry of Overseas Development's research requirement boards. In U.S., recognition of this component to technical assistance has been given by the creation of the 'Office of Science and Technology' in AID's Bureau of Technical Assistance. The Federal Republic of Germany, with its emphasis on technology-transfer issue-areas has developed formal closer ties between its aid-giving Ministry of Economic Cooperation and the Federal Ministry for Research and Technology. Japan, Sweden and Netherlands, on the other hand, have spear-headed research in this area with the creation of special governmental agencies for research cooperation with developing countries. It may be too early to point out the effectiveness of these new sets of institutional mechanisms, but their existence signifies an increasing recognition on the need for a policy direction in the area of scientific assistance.

In addition, the foregoing preliminary examination of the OECD countries shows a considerable consensus on principles underlying their involvement in this area. Most of them have gone to great lengths to define the scope and criteria for their involvement and development of scientific programs. Subject-areas in which collaboration is being sought with developing countries range from the design of animal drawn equipment to the application of satellite technology for communication and remote sensing for resource management.

New Approaches to Scientific Assistance: Three Forms

In the approaches of OECD countries reviewed, three dominant forms of scientific cooperation become evident:

i) assisting the developing countries to build up their own R&D capacities - innovative skills and the institutions required to solve their problems with the majority of work performed in developing countries themselves;

ii) using developed country's domestic R&D establishments to help solve LDC problems; and

iii) undertaking R&D 'twin' projects oriented to cooperative research programs with developing countries.

Most scientific assistance fits into the first two categories. U.K. and France, for example, are mostly involved in undertaking work in their specialized national laboratories for LDCs. Germany and U.S. tend to contract out relevant research and technical work. Sweden, on the other hand, through its SAREC organization, is seeking to help developing countries build their own capabilities through multilateral programs and the services of Swedish researchers.

With regard to cooperative R&D per se, Japan and Netherlands's efforts come closest to the third type. In the case of U.K., 15% of governmental effort (in 1975) could also be identified under this category.

With reference to the Canadian effort, its major involvement in this area is through IDRC. IDRC's major concentration has been on funding of research programs; however it does not have any 'in house' research facilities - most of the work is performed outside Canada, in developing countries themselves. Furthermore, unlike, U.K., France and Netherlands, Canada has neither undertaken significant research projects on behalf of the developing countries in its governmental laboratories, nor are there any policy mechanisms available for initiating joint research projects with developing countries. The three CIDA-funded projects earlier presented as the case-studies of federal departmental involvement in this area, suggest the ad hoc nature of twinning component in these projects. A commentary on the subject with particular reference to IDRC's role is provided in Volume I of the report.

In summation, the above examination shows that 'Twinning' is becoming increasingly an issue-area of major concern in most of these OECD countries' technical assistance strategies. Japan and Netherlands are now actively involved in R&D Twins. Britain and France, in their own way, have maintained sustained working relationships with research organizations of many of their former colonies. An active interest is evident amongst all of these countries, on policy and institutional levels in that they have successfully created coordinating mechanisms for overseeing the transfer of technical know-how to developing nations.

The foregoing suggests that consideration be given to evolving parallel policy structures in Canada. Prior to the establishment of Twinning programs, it could be useful, as the experiences of other OECD countries suggest, to consider the formation of a small central body within CIDA or IDRC. Such an organization could evolve 'joint' research programs oriented to LDC needs; provide professional advice during their processing and programming; assess Third World needs in a prospective context; and forge links both within the Canadian scientific community and with scientific organizations in developing countries.

APPENDIX A

U.K.'s R&D Assistance to LDCs (1975)

		(in pound sterling)
I.	Research projects on contract to universities or similar institutions	4,959,000 (52,20%)
II.	Support to British scientific establishments (government, semi-government and long-term supported private agencies)	2,470,000 (26.0%)
III.	Support to International Research Centres	1,150,000 (12.1%)
IV.	R&D as a part of U.K.'s aid program to particular countries	920,000 (9.7%)
	A -	9,499,000 (100%)
	Total Aid budget (1975)	£471,000,000

A % of B: 2.01%

Source: Tabulated from data provided in the Ministry of Overseas Development's Report on Research and Development, 1975, London, U.K.

Projects Carried Out by British Institutions Receiving Long-Term Support (1975)

Name of Establishment	Field	Country of primary research	No.	Under 5 years duration	5-10 years duration	long-term & continuing projects	Joint Projects
1. Overseas Division, Institute of Geological Sciences.	Geology	LDCs	6	6			
2. Overseas Division Hydraulics Research Station.	Water Resources	LDCs	9	9			
3. Centre for Tropical Veterinary Medicine	Livestock Production & Health	U.K. & LDCs	11	6	5		4
Centre for Tropical Veterinary Medicine	Typanasomiasis	U.K.	2	2			1
4. Centre for Overseas Pest Research	Pest Control	U.K. & LDCs	24	9	3	12	4
5. Commonwealth Forestry Institute	Forestry	U.K. & LDCs	11	10	1		11
6. Overseas Department National Institute of Agriculture Engineering	Agriculture Engineering	U.K. & LDCs	7	4	2	1	4
7. Tropical Products Institute	Post Harvest Processing						
	I. Food Commodities	U.K.	47	40	4	3	
	II. Non-Food Commodities	U.K.	39	30	3	6	
	III. Industrial Processing	U.K.	36	31	2	3	
	IV. Storage	U.K.	24	21	1	2	
8. Overseas Division, Building Research Establishment	Construction	U.K. & LDCs	3	3			2
9. Overseas Unit, Transport and Road Research Laboratory	Transport	U.K. & LDCs	18	18			10
			237 (100%)	189 (80%)	21 (9%)	27 (11%)	36 (15%)

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Source: Tabulated from data provided in Ministry of Overseas Development's R[redacted] c[redacted]ear[redacted]nd [redacted]lop[redacted] 19[redacted] Lon[redacted] U.[redacted]

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