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COOPERATIVE INTERNATIONAL DEVELOPMENT RESEARCH

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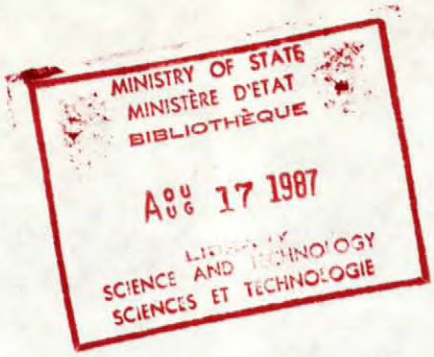

COOPERATIVE INTERNATIONAL DEVELOPMENT RESEARCH

Volume II

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SECTION I

The Relevance of Canadian R&D to Problems of the Developing Countries

It is easy, in the midst of a biting northern winter to conclude that Canada's R&D expertise will have little relevance to the needs of the developing countries. The truth, of course, is 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 different countries. Canada's remote northern communities share common problems of communication, health delivery, sanitation and economical energy with many developing countries; research to control the blackfly and spruce budworm is directly relevant to the locust and river blindness disease carrier; the need for adequate food is common.

Nevertheless it was considered desirable as part of the study to develop some 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 countries of the Third World.

This Section, therefore, presents the results of a quick, general survey carried out with the much appreciated help of IDRC, the Resources Branch of CIDA, and the departmental representatives participating in the study. No excuse is made for its superficiality for there was neither time, resources nor need for a detailed analysis. Such an analysis will form an important part of the strategy, discussed in the body of the study, needed if a policy decision is made to utilize Canadian R&D as part of our international development program. Neither has any attempt been made to cover all needs, to list all sectors of expertise, to give priorities or amass any but a few illustrative examples.

For present purposes all that is required is to give some assurance that pertinent expertise does exist. The enclosed data sheets are presented in the belief that it does.

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AGRICULTURE

General:

The importance of agriculture to the countries of the Third World can hardly be overemphasized. The bulk of their populations live in poverty in rural areas. Malnutrition is common and worsening as populations grow. Migration to the cities and urban centres is increasing. Agriculture is often the only sector producing exportable goods which in turn distorts production away from meeting basic national nutritional needs. Compounding all this are rising world food prices and increasingly acute shortages.

There is, therefore, a priority need, widespread throughout the Third World for substantial improvement in agricultural productivity and nutritional value of locally produced foodstuffs, especially at the non-market or subsistence level.

Major Priority Problem Areas of the LDCs:

- More abundant and efficient common food production, storage and distribution aimed as far as possible at self-sufficiency.
- Development of needed resource and potential data bases (soil, water, land use etc.)
- Improvement of national nutritional levels by developing hardier, more productive animal and plant strains.
- Development of more productive sustainable agricultural systems, processes and techniques (e.g., Multi-cropping, including increasing the long-term productivity of high altitude and marginal lands.
- Development of irrigation systems.
- Development of alternate methods of fertilization (e.g., nitrogen fixation).
- Development of appropriate cheap, reliable and efficient agricultural equipment.
- Reduction of crop losses in harvesting, threshing, drying and storage including loss through insect pests and disease.
- Increase in local processing of crops.

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- Reduction of incidence of soil degradation and desertification due to inappropriate land use.

Compatible Canadian R&D Expertise/Sectors:

Although in many cases, research to solve specific problems in the production of agricultural products needs to be conducted in an environment similar to that in which the problem is found, many of the principles and much of the methodology needed to solve the problem are transferrable from one environment to another. From this point of view then, the following Canadian expertise is available for use in Third World Countries by their scientists and agriculturists with or without help from Canadian counterparts:

- techniques for developing data bases on soil classification and utilization, water use for irrigation, yield estimates, and estimates of crop losses from disease, insect and weed infestations;

- plant and animal breeding techniques particularly with cereals and domesticated livestock including poultry;

- techniques for the design and construction of irrigation systems, including storage, delivery and on farm;

- development of nitrogen fixing bacteria for cold soil conditions;

- design and construction of farm equipment appropriate for use in Third World Countries;

- storage and processing of crops.

Selected Examples:

1. Rainfed Agriculture in India

The initial research, commencing in the 1930's, was done in Canada on the Great Plains. It developed methods and varieties of crops that could optimize the use of limited rainfall while economically producing commercial quantities of cereal grains and fodder for livestock without debilitating the soils when under cultivation. Today, in Canada, drought cycles do not result in total crop loss.

India came to Canada seeking advice and help in producing crops on their extensive areas of non-irrigable (rainfed) lands. The methods devised in Canada were not directly applicable to Indian conditions because of different precipitation patterns.

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This is a cooperative venture at 23 research stations located throughout the various rainfed areas of India. Canada contributes 5 scientists to the coordinating group, laboratory and field equipment, and training in Canada for Indian scientists and technicians. India contributes counterparts to the coordinating group, laboratories and experimental fields, and 230 scientists plus needed technicians at the 23 research stations.

2. Triticale Research

Triticale is a new hybrid cereal grain resulting from a cross between wheat (Triticum) and rye (Secale). As nutritious as traditional cereal grains it is far hardier and thus able to be cultivated in land such as the Andean, North African and Mediterranean high plateaux unable to sustain wheat production.

In 1971 IDRC initiated a major cooperative research venture between CIMMYT (an international agricultural research centre in Mexico) and the Universities of Manitoba and Guelph.

The aim of the project has been to produce a highly nutritious cereal grain that would outperform traditional grains in terms of yield and hardiness.

Because the Mexican research centre has a large and diverse pool of wheat genes and an international network of collaborating plant scientists, it has concentrated on developing and testing a wide spectrum of new genetic combinations of triticales. The University of Manitoba has concentrated more on developing new techniques for increasing the number of viable crosses, looking for genotypes that are less sensitive to day length and for other characteristics such as cold tolerance and resistance to smut and rust diseases. Plant scientists at Manitoba also deal with the more fundamental problems related to infertility and shriveled seed.

Varieties produced have now been tested in more than 50 developing countries as part of their national programs. Yields and protein contents as high as more traditional wheat cereals have been obtained in areas in which wheat could not be economically grown. Some of these varieties would be suitable for growth in Canada and indeed several are already being used in the U.S.A.

3. Cooperative Wheat Breeding Program with Brazil

Brazil had established and staffed a wheat breeding research station at Passo Fundo in the southern wheat producing

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area of the country. Because the staff was young and inexperienced they did not make the progress expected. As a consequence, Brazil approached Canada for help in planning and directing the research and breeding programs at Passo Fundo. Out of this request developed a twinning between our major wheat breeding research station at Winnipeg and the Passo Fundo station.

Because of the north-south relation across the equator it is possible for scientists and technicians to visit their counterpart in a non-growing season and in fact obtain two sets of field data within a twelve month period. One to three Brazilian scientists visit Winnipeg between June and September each year while Canadian scientists visit Passo Fundo between December and March. Thus two field generations of wheat are grown and Canada has benefitted from this aspect while we belive Brazil has benefitted from the consultations and help in planning and executing its research and breeding program.

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FISHERIES

General:

The importance of fisheries to the developing world comes from their contribution to food supplies, the need to provide continuing employment to communities and the high value export potential of the resources.

To these major basic needs are now added the many opportunities and responsibilities resulting from the U.N. Law of the Sea negotiations. As a major coastal state, anxious to maximize our own control and utilization of offshore resources, Canada has a clear common interest with the many coastal LDC's in the sound management and exploitation of the fish resources of the world's oceans.

Major Priority Problem Areas of the LDCs:

- Development of fisheries economic zones (200 miles).
- Resource management programs.
- Elimination of fish waste:
  - improvement to fish handling, processing and distribution;
  - use of incidental catches.
- Development of aquaculture or "fish farming".

Compatible Canadian R&D Expertise/Sectors:

- Major capability in fish resource development and management.
- Substantial research expertise and resources - including some 16 research vessels - covering oceanographic, biological and fish technology areas.
- Protection, maintenance and restoration of aquatic environment.
- Ocean and inland fish specie development, stock assessment and disease control capability.

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- Harvesting techniques (multi-purpose fishing vessels, pelagic trawling etc.).

- Catch process, inspection and quality-control technology capability.

- Stock conservation and environmental research capability.

Selected Examples:

1. Cooperative Peruvian/Canadian Research Study of Anchovy

The Peruvian anchovy represents a major economic resource to the country. The fishery however, is dependent upon nutrients brought to the surface by an upwelling system near the coast. It started to decline in 1972 because of the weakening of this system (the El Nino phenomena), and because of overfishing

In order to investigate the relationship between the biology of the anchovy species and the upwelling, a cooperative research project was funded by CIDA involving the Institute DEL MAR DEL PERU (IMARPE), the Bedford Institute of Oceanography and Dalhousie University.

In 1977 the Canadian research vessel Baffin cruised Peruvian waters researching, together with Peruvian scientists, the food chain dynamics and behaviour of anchovy and competitive species. The resulting raw data has been analysed during 1978 at the Bedford Institute.

Apart from valuable data regarding the Peruvian anchovy, evidence of other fish resources of practical value has been developed, a sea-water aquarium for study of marine organisms has been established at IMARPE, and a great deal of valuable training and experience has accrued to mutual benefit.

2. Milk Fish

In the Philippines, Indonesia and Taiwan, milk fish is a major source of food protein. The fish is grown in inland ponds but until 1977 could not be bred. Instead, fingerlings have to be caught in coastal waters and transported - at great loss - inland.

In 1977 the spawning of the first female milk fish in a tank at the Pandan aquaculture research station in the Philippines made headlines. This success, since repeated in other experiments including Chinese carp, was the result of two IDRC funded projects in Canada. The first enabled researchers at the University of

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British Columbia to demonstrate that fertility could be induced through injections of gonadotropic hormones extracted from the Pacific Salmon. The second enabled them to work through a commercial fish packer to extract and process the gonadotropin and ship it to various IDRC projects around the world.

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FORESTRY

General:

Forests are of substantial potential importance to many LDCs because they are a renewable source of food, fuel, material and export earnings. This potential is largely unexploited or inappropriately exploited because of lack of knowledge, policies, resource inventories and skilled people.

Major Priority Problem Areas of the LDCs:

- Lack of cheap, effective resource management e.g.,
  - lack of reliable resource inventories;
  - underutilization;
  - uncontrolled exploitation.
- Development and improvement of forest conservation methods, primarily against fire and insect pests.
- Improvement of wood extraction methods and equipment to reduce cost and minimize impact on the environment.
- Increase the knowledge of tropical wood technology and of transformation techniques and equipment.
- Poor commercialization.
- Desert encroachment.
- Conversion of forests to agricultural purposes for which soil is not suited.

Compatible Canadian R&D Expertise/Sectors:

- Resource inventory/mapping, and evaluation.
- Tree genetics.
- Reforestation and tree farming
- Dryland silviculture.
- Erosion and insect control.
- Mechanization of forest operations.
- Pulp and paper mill processes and equipment.
- Experience in hard wood utilization as fibre source.
- Remote sensing (airborne, satellite systems).

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Selected Examples:

1. Development of New Forest Inventory Methodology Applicable Under Tropical Conditions

The Forestry Management Institute (FMI) has developed a forest inventory method based on large scale (1:500 to 1:3000) aerial photographs, a foliage penetrating radar altimeter and an aircraft altitude indicator. The method eliminates most of the expensive field work required to collect inventory statistics.

Following successful application of the method under temperate conditions, its potential under the more difficult tropical conditions was recognized. A preliminary test in Guatemala was followed by a more comprehensive test in Surinam carried out with the cooperation of the Food and Agriculture Organization of the United Nations, the International Development Research Centre and the Geodetic Institute of Surinam. This trial provided information which permitted the Canadian company concerned to build a prototype radar altimeter optimized for tropical conditions. With the cooperation of the FMI the company subsequently tested this new system in Costa Rica achieving excellent results. In addition several new applications outside the fields of forestry have emerged.

Specific benefits of this development were:

i) A new system became available which can be applied under difficult tropical conditions where lack of reliable forest inventories has always presented an almost insurmountable obstacle to good forest management.

ii) Development of the system led to other unforeseen applications (such as drain profiling) of high potential in Canada.

iii) The province of Alberta is now using the system in its forest inventory program.

iv) Direct benefits to the Canadian manufacturing industry in terms of modifications and testing of the radar altimeter in non-Canadian environments and indirectly by exposure to future potential markets.

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2. Development of Thematic Map of Lombok Island, Indonesia

In 1977 work began on a project aimed at producing a vegetation and land use map (1:250,000 scale) of Lombok Island in Indonesia. The work funded by IDRC, and carried out by Z.D. Kalensky of the Department of the Environment in cooperation with Indonesian scientists, included the development of a methodology using computer-aided processing of Landsat multispectral imagery.

Completed in 1978 the project resulted in production of a three-colour map and useful research on aspects of applying computer-aided image processing to vegetation and land use mapping in tropical regions.

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ENERGY

General:

Many LDCs are facing an increasingly acute energy crisis due to an inability to increase indigenous production to meet the needs of rising populations and commercialisation - a situation exacerbated by rising world oil prices. The majority of LDC populations live in rural areas where rising numbers and agricultural clearance of forests is rapidly depleting the wood which currently meets most of the rural energy needs. The cities and urban areas rely heavily on oil. In the short term therefore, ways of improving the efficiency of utilization of existing resources and where possible fossil fuel exploration and development, are priorities in order to buy time for the development of appropriate alternative sources of energy.

Major Priority Problem Areas of the LDCs:

- Heavy dependence upon oil for commercial activities.
- Need for exploration and development of new and alternative sources of energy.
- Lack of rural energy sources, e.g.,
  - need for small scale hydro-electric generating plant (microhydel).
- Inefficient conversion of available energy (mainly wood, dung and animal power) e.g.,
  - open fire for cooking is less than 10 percent efficient;
  - inefficient design of plows, carts and simple bearings.
- Finding alternative ways of meeting cooking energy needs.
- Lack of adequate data bases respecting energy needs and potential.

Compatible Canadian R&D Expertise/Sectors:

- Major capability in energy survey and data base establishment.
- Fossil fuel exploration and extraction techniques, systems and hardware development.

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- Large and small scale hydro-electric infrastructure design and development.

- Major capability in forest resource management techniques, processes and hardware, research in fast-growing fuel wood varieties.

- Research and engineering capability in wood burning equipment, charcoal production and utilization.

- Growing renewable energy technologies capability, increasingly important domestically, in such areas as solar, wind, small-scale hydro and biomass.

Selected Examples:

1. Renewable Energy

Renewable sources of energy are the principle energy sources for rural areas of the Third World. Technologies to improve their efficiency and to provide better choice and management, are clearly of prime importance.

In Canada the growing importance of these energy sources is already being manifested in higher government R&D priorities and NRC programs in such areas as solar and wind machine technologies, photo voltaic cell development and biogas digestion processes.

Examples of illustrative R&D areas in the renewable energy field which could, to mutual benefit, be considered for application to international development are given overleaf.

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TECHNOLOGIES	APPLICATION	POSSIBLE AREAS OF R&D	REMARKS
1. Photovoltaics	- communications and signals. - small-scale irrigation.	- design optimization of production application. - applications testing. - array reliability testing.	- would match Canada's telecommunication capability. - NRC supporting industrial development of PV cells.
2. Gasification	- synthetic gas. - methanol.	- application testing. - design/economic optimization. - small-scale remote applications.	- recent NRC research breakthrough in digester technology.
3. Flat Plate Collectors	- water, space heating (crop drying).	- realiability, efficiency, economic performance.	
4. Low Head and High Head Small-Scale Hydro	- hydro-electric power generation	- low head turbines. - small transportable units. - economic optimization.	- Ontario Hydro testing small-scale hydro electric generating sets (250 KW) for remote applications e.g., Wesdale Falls (Indian Reservation Application).
5. Wind Machines	- Electrical power. - Mechanical power	- design optimization for LDC and remote Canadian environments.	- NRC program. - Canadian machines in Magdelen Islands, Newfoundland, Saskatchewan. - burgeoning Canadian industry (e.g., DAF Ltd.).

TRANSPORTATION

General:

An effective transportation system is one key element in the socio-economic development process of a nation, affecting trade, the opening of new markets, communication between people and their access to community services. In particular, to those many developing countries relying heavily upon the export of large bulk, low cost raw materials, it represents a major portion of overall costs.

Major Priority Problem Areas of the LDCs:

The development, as appropriate to individual needs, of a transportation infrastructure. In particular:

- The development of feeder or developmental roads in rural areas.
- The maintenance or refurbishing of existing facilities and equipment.

Compatible Canadian R&D Expertise/Sectors:

- Multi-modal transportation sector systems studies.
- Railway infrastructure and system studies.
- Train track dynamic research.
- Innovative urban transit technology.
- Off-road transportation system technologies.
- Air transportation system studies.
- Short take-off and landing (STOL) technology.
- Marine transportation system studies.

Selected Examples:

1. Some 250 STOL aircraft for low density or remote routes have been exported to LDCs.
2. Many rail and river transportation systems have been planned and engineered in LDCs by Canadian experts.

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TELECOMMUNICATIONS

General:

Many LDCs, while possessing some telephone, radio and television facilities do not possess national coverage in these areas. In particular, low cost, reliable and easily maintained national telephone systems are needed.

Probably more than most other sectors, telecommunications is, or ought to be, a prime target area for the application of the national R&D capabilities of many industrialized countries on behalf of international development. The R&D involved is characterized by high investments, and rapidly changing equipment and problems related to work environments. Although aimed at national priorities many benefits from this R&D can accrue to the LDCs in the shape of improved equipment and systems design.

Major Priority Problem Areas of the LDCs:

- Development and modernization of national telecommunication facilities essential to economic and social development.
- Economical and technical solutions to problems of providing telecommunications to rural and isolated areas.
- Appropriate technology in terms of equipment reliability and ease of operation and maintenance.
- Reliable power supplies for telecommunications services in isolated areas.
- Effective utilization of remote sensing technology.

Compatible Canadian R&D Expertise/Sectors:

- National or large scale telecommunications.
- Satellite communication systems, including satellite components and sub-systems.
- Ground station systems including small, low cost earth station systems and equipment for telecommunications and remote sensing applications.

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- Major rural and remote telecommunication system and hardware development capability.

- Mobile and portable communication systems and component development capability including automatic battery-operated repeater stations.

- Fibre optics components development and system engineering capability.

- Expertise in radio propagation, spectrum utilization and radio environment.

- Development and application of techniques for assessing electronic sub-system and component reliability.

- Data systems and network development capability (digital switching and transmission).

Selected Examples:

1. Remote Sensing

A joint research project is taking place between the Canada Centre for Remote Sensing (CCRS) and its Peruvian counterpart. The main objective is to assist the Peruvian scientists to develop a laboratory design and system appropriate to Peruvian needs for a national remote sensing centre. Scientists of involved Peruvian institutions prepare problem-oriented research projects for execution in the CCRS facility. Follow-up research is undertaken in Peru.

2. Microwave Propagation

Following a major regional seminar on satellite communications held in May 1978 in Peru and addressed via "Hermes" satellite by the Honourable Jeanne Sauvé, Peru requested the Department of Communications to participate in a cooperative venture aimed at research microwave propagation through tropical atmosphere.

The proposal held promise of mutal benefit and Canadian scientists at the Department of Communications' Communications Research Centre were prepared to design appropriate ground reception equipment to carry forward the project. The results would have provided not only needed information, which could later be used in designing appropriate systems for satellite communication in Peru and other tropical countries, but also an opportunity for training Peruvian engineers in a high technology area.

No support has to date been forthcoming from CIDA or IDRC and application is being made by Peru to the Inter-American Development Bank for funding.

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HEALTH

General:

Tropical diseases and over-population are two major interrelated problems facing most countries of the Third World. Over-population in many LDC environments leads directly to disease and yet until mortality rates decrease significantly - particularly infant mortality - family planning will not be socially acceptable even if cheap effective methods are readily available.

The several major tropical diseases - malaria, schistosomiasis, filariasis, diarrhea etc., affect several hundred million people causing early death, debilitation and suffering on a gigantic scale.

Biomedical research in Canada accords with the needs of the LDCs in that it is knowledge oriented on a global basis and through the provision of proper motivation and incentive it can be problem-directed depending on concerted program approach. Transfer of technology in that sense is transfer of knowledge through research training and conduct of research on models beneficial to both parties.

Major Priority Problem Areas of the LDCs:

- Tropical disease control.
- Development of effective health care systems including the use of paramedical or non-medical resources.
- Maternal and child health improvement.
- Control of insects and other diseases vectors.
- Need for simple, safe, low cost fertility regulation.
- Lack of basic nutritional knowledge and planning.

Compatible Canadian R&D Expertise/Sectors:

- Major medical research and health service delivery capability.
- Remote and rural heath care systems varying from satellite consultation to rural or outpost nursing program/systems.
- Major research and development capability in vaccines and immunology.
- Fertility research.
- Biological insect pest control and disease vector pathology.
- Research strength in most areas of expertise in biomedical disciplines.

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Selected Examples:

1. Canadian Airborne Radar System for Locust Control

Specially instrumented aircraft are now able to explore wind systems for the systematic location of concentrations of flying insects, to detect and assess these concentrations by radar, and to collect samples of flying insects for study.

Particularly important progress in terms of equipment and system R&D has been recently achieved in Canada and applied successfully in New Brunswick to detect and air-to-air spray the spruce budworm.

In 1976 the New Brunswick Minister of Natural Resources wrote to CIDA pointing out the applicability of this research to some of the major LDC insect disease vectors (e.g., river blindness) and pests (locusts). Both CIDA, the U.K., and subsequently FAO experts confirmed the potential of the Canadian system and the FAO proposed in January 1977 a modest project, ($350,000), through which the system would be applied in Niger and Upper Volta.

In addition to offering a means of detecting, studying and selectively combating air-borne insect pests, the system also produces detailed information on wind systems of substantial value in understanding rain mechanisms of obvious importance to regions of drought such as the Sahel.

The further development of this Canadian system offers obvious potential to the Third World, to further Canadian applications and to Canadian technological development. The proposed project was NOT able to be supported nor is there to date any signs of future support becoming available.

2. Contraception Methods - Sperm Inhibition

With the development of large family planning programs and the changing role of women in societies, renewed emphasis is being placed on male methods of contraception. In view of earlier difficulties and failures with the use of drugs, such as steroids, there is a growing realization of the need to develop a more profound knowledge of the physiology, anatomy and biochemistry of the male reproductive system.

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One initiative in this area was a proposal in Chile to research the process of sperm penetration through coatings of the human ovum and specifically to produce evidence that the process can be inhibited by means of immunological interference with the function of two specific sperm enzymes - hyaluronidase and acrosin.

Owing to laboratory difficulties in Chile it was decided in 1978 to set up a joint research venture between the Departments of Biochemistry, Obstetrics and Gynaecology of Queen's University, Canada, and the Laboratories of Microbiology and Endocrinology of the Catholic University and Outpatient Clinic for Research in Fertility Regluation in Santiago, Chile.

The project is estimated to take about three years at a total cost of some $248,000, jointly funded by the IDRC and the National Centre for the Family, Chile. In general terms, Queen's University will isolate and purify certain enzymes from human spermatozoa and conduct immunological studies. The Chilean Laboratories will be carrying out bioassays dealing with immunological interference with the block of spermatozoa on isolated ova.

3. Immunopathology and Immunology of Parasitic Diseases

A major area of research and development which permits effective interaction between Canada and the developing nations is Immunopathology and immunology of parasitic diseases. From the Canadian point of view, many of our immunologists are well-trained to provide technological expertise and could use parasitic organisms as models of host immunoresponse studies.

4. Chancroid Infection

Current interest in chancroid infection and the potential for collaboration of the Department of Medical Microbiology (University of Manitoba) with the University of Nairobi Clinic for Sexually Transmitted Disease.

In July 1975, and outbreak of chancroid was noted in Winnipeg. In the subsequent three and a half years, we have developed a broad research program looking into the etiology, pathogenesis, epidemiology and genetics of the disease and its etiologic agent Haemophilus ducreyi. This is the only group anywhere in the world to be studying this disease. The group has now a number of strains for study.

The investigators are currently developing two additionnal protocols of research in this field in cooperation with the University of Nairobi and they are collaborating with the Center for Disease Control in Atlanta, Georgia, USA and the World Health Organization.

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WATER SUPPLY AND SANITATION

General:

It is estimated that there are 1200 million people in the Third World without adequate access to safe water supplies and sanitation. The U.N. has declared 1980 to 1990 the international water and sanitation decade with the prime objective of meeting this deficit.

Major Priority Problem Areas of the LDCs:

- Lack of potable water and proper sanitation.
- Lack of cheap, reliable ground-water extraction, treatment and distribution technologies.
- Need for ground-water exploration and resource studies.
- Need for low cost sewage treatment systems and low cost alternatives to piped sewage systems.
- Wastes reclamation and re-use (treatment pond, fish, surface evaporation and seepage problems in reservoirs).
- Ecologically sound control of aquatic growth in reservoirs.
- International rive basin planning and management.
- Drainage basin rehabilitation.
- Lack of qualified personnel at all levels.

Compatible Canadian R&D Expertise/Sectors:

- River basin planning and management methodology.
- Ground-water exploration and development methodology including drilling, geophysics, aerial photograph interpretation, numerical modelling.
- Research on water eutrophication (of lakes etc.).
- Operational research techniques to analyse and plan water distribution systems, maintenance and repair schedules.

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- Waste treatment process development.

- Appropriate technology development for remote community water supply and sanitation.

- Irrigation and water pumps/systems.

Selected Examples

1. The "Waterloo" Water Pump

Village water wells in many developing countries are subjected to strenuous use and a very high proportion of them are out of service because of mechanical and other failures.

In view of the great importance of readily available potable water supplies, the IDRC in 1976 requested the University of Waterloo to design and develop a simple, robust, low-cost and reliable reciprocating piston pump specifically aimed at LDC needs.

Written into the original project was a foreseen requirement for manufacture and for field testing of the pumps under LDC conditions. By 1978 a successful design had been produced and laboratory tested in both Canada and the U.K. Manufacture and field testing of some 80 "Waterloo" pumps is now underway in the Philippines (The Institute of Small Scale Technologies) and in Thailand (The Asian Institute of Technology).

The potential importance of the application of this modest amount of Canadian R&D to Thailand alone can be judged by the fact that over 60 percent of the country's 35 million rural people do not have reasonable access to clean water supplies and that a large sum is spent annually on repair and maintenance of 7,000 imported landpumps.

2. Mobile Sewage Systems

The Northern Technology Unit of Environment Canada is developing systems of sewage removal and treatment for the North West Territories. Sewage holding and removal is a major problem under conditions of perma-frost where low income communities cannot afford the very expensive underground facilities.

The technology involves design and construction of simple holding vaults, very low volume flush toilets, specialized vacuum suction vehicles and a centralized biological waste treatment system.

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This technology is equally applicable to the many huge squatter communities adjacent to large urban centres in many developing countries where underground sewage systems are not economic and where there is little space for pit latrines which in any case represent a major health hazard in tropical conditions.

Already under development in Korea and Taiwan, the technology has clear potential for cooperative development ventures in certain selected developing countries or regions.

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ENVIRONMENT

General:

Consideration of the environmental aspects of development - eco-development - is difficult because environmental concerns form an indivisible part of many other sectors (e.g., natural resource development and conservation); they are also usually very difficult to reconcile with the urgent need of most LDCs for rapid economic growth. Certain broad principle needs however, can be categorized which are matched by existing Canadian R&D expertise.

Major Priority Problem Areas of the LDCs:

- Research aimed at identifying current and potential environmental problems of water, soil and air pollution resulting from industrial and urban growth.

- Development of environmental sensitization programs particularly at decision-making levels.

- Incorporation of environmental considerations into development assistance, (e.g., adverse consequences of large development projects including power dams and irrigation schemes, their pre-project identification, and mitigation).

- Adequate trained resources to support national environmental programs including the development of local solutions to environmental problems.

- Development and incorporation of environmental protection standards, legislation, and control mechanisms; practice of "eco-development".

- Integration of environmental awareness and research with planning of national programs.

Compatible Canadian R&D Expertise/Sectors

- There is existing Canadian R&D expertise in all of the above areas.

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INFORMATION SCIENCE/STATISTICS

General:

Although all countries are to some degree dependent upon knowledge generated elsewhere in the world, it is particularly true in the case of the LDCs. At the national level, information is a basic key element in the process of policy or program development and evaluation. Much of the information, technological or otherwiseu needed by any given developing country is probably freely available somewhere; the problem is how to know where to look for it and to be able to make it easily accessible to those needing it once found. A similar need to develop user-oriented information systems covering areas of priority concern exists on an international and particularly a regional basis.

Statistical data represents a special information category in terms of its importance - particularly to developing countries. It is self-evident that statistical information is a critical component for policy development, program planning, priority setting, and project evaluation. All countries, and more particularly developing countries, require mechanisms which monitor social change, economic conditions, educational progress, and the vast array of other phenomena with which modern states must concern themselves. Provision of adequate assistance to help developing countries establish necessary statistical systems is therefore a priority concern.

Major Priority Problem Areas of the LDCs:

- Poor control of documents produced in the country in all fields (e.g. scientific and technical research publications, government reports, planning documents, university theses).
- Inadequate national information infrastructures and systems (e.g. libraries, documentation centres, inter-library loan networks).
- Lack of trained librarians and information specialists and poor recognition of the need for these people.
- Poor coverage of developing-country literature in many developed-country information systems.
- Poor access to documents stored in developed-country libraries and information centres, coupled with slow communications (e.g. photocopies sent by mail).
- Continuing need to use foreign exchange resources for acquisition of foreign literature, including photocopies.

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- Need for 'repackaged' information provided by specialized information analysis centres to meet the specific requirements of particular users, individuals or institutions (e.g. Cassava Information Centre, Asian Information Centre for Geotechnical Engineering).

- Development of extension services, particularly in the areas of agriculture and small industry.

- Development of appropriate national statistical systems to permit the monitoring of national economic and social parameters.

Compatible Canadian R&D Expertise/Sectors:

- National level scientific and technological information systems and methodology development.

- National statistical systems design and development.

- Industrial extension service design and development.

- Computer systems soft and hardware development.

- Design of small specialized information analysis and delivery systems.

- Library and bibliographic systems development.

- Resource satellite ground systems design and development.

- Design of international cooperative information systems and assistance to enable developing countries to participate.

- University Schools of Library and Information Science.

Selected Examples:

1. TECHNONET

The development strategies of many LDCs, particularly those in Southeast Asia, have emphasized the growth of small and medium scale industries. A key need of such industries is technological advice and assistance including information on the latest research, but predominantly with emphasis on using existing experience to solve the problems of the small entrepreneur.

The Technical Information Service of Canada's NRC has been developed over the years to provide an industrial extension service of world repute and indeed has served as a model for several similar systems in other developed and, more recently, developing countries.

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In 1972, IDRC initiated and funded the development of a major regional industrial extension network, now involving eleven institutions in nine Southeast Asian nations. The network was developed as a cooperative venture using the expertise of NRC's TIS, but drawing first on local resources in the network to solve local problems. A primary objective has been to train extension engineers in the region.

In view of the success of TECHNONET, as the system was named, a second grant for a three year phase of the joint venture was awarded in 1976. This is aimed at extending the network to include other institutes, reinforcing its capabilities, and making it independent of IDRC administration. TECHNONET Asia is now being established as an autonomous Asian body, which will be able to receive grants from IDRC and other donors.

Since the commencement of the program NRC's TIS has provided to TECHNONET and other LDC's technical advice in response to some 1600 enquiries, has trained 39 technical advisors and provided 10 consultants to assist systems development. Apart from the goodwill engendered and intrinsic value to the LDCs involved, this project has provided useful information to TIS and has enabled many foreign contractors to be referred to Canadian equipment manufacturers.

2. MINISIS

Big regional and international information systems depend on computers for the central processing of the large numbers of documents involved. To fully exploit the products, which include magnetic tapes as well as printed bibliographies, computers are also necessary in participating countries, especially for services tailored for individual users. Many developing country information centres now have access to large computers in other institutions, but there are problems of cost, conflicting work priorities, access to the computer for system development, and inadequate knowledge of bibliographic requirements on the part of the computer operators.

In 1975 IDRC began to design an in-house system that would handle bibliographic operations, including the library, data base construction and information retrieval, on a minicomputer cheap enough to be dedicated to one institution. A deliberate objective was to produce an inexpensive reliable combination of hardware and software that could be offered to developing-country institutions for use in handling their own information and in connection with international cooperative bibliographic systems such as AGRIS (International Information System for the Agricultural Sciences and Technology) and DEVSIS (Development Sciences Information System). For its own bibilographic work IDRC was already using a computer system known as ISIS, developed by the

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ILO for a large IBM computer and used by several international and national organizations. The in-house system incorporated many of the features of ISIS and was called MINISIS to preserve this international connection.

At the beginning of 1978, the Centre was able to transfer all its bibliographic activities from the big computer at a service bureau to its in-house minicomputer and, after a years' experience, is now able to offer MINISIS to other institutions. The conditions for transferring it to different types of institution in developed and developing countries are being worked out, and several developing countries are interested already in acquiring it.

3. CAN/SDI

The Canada Institute for Scientific and Technical Information has developed a package of computer programs known as CAN/SDI, which has attracted considerable attention around the world. It enables a computer to search large bibliographic data bases, such as Chemical Abstracts or Engineering Index and to print out regular lists of references corresponding to the specific interests of individual users. This reference service has been available in Canada for about ten years, and the program package has been offered to other countries through Unesco's UNISIST program. CISTI staff have helped to train staff from several countries, developing and developed, in the operation of a service of selective dissimination of information.

4. STATISTICAL SYSTEMS

Various data base management systems developed by Statistics Canada have been provided to developing countries. These include RAPID, STATPAK and CAN-EDIT.

SECTION II

Policies and Mechanisms of Other Industrialized Nations

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May, 1979.

Introduction

The purpose of this section is to describe succinctly the policies and programmes of other OECD members in the area of scientific and technological cooperation with the Third World. It is intended that the paper represent an indicative as opposed to an exhaustive review of these activities. It will be factual as opposed to analytical in nature.

The countries selected for review are France, the Federal Republic of Germany, Japan, the Netherlands, Sweden, the United Kingdom and the United States of America. It is considered that the policies of these nations provide a good representation of the options and alternatives available. They include the major ODA[1] contributors as well as the main actors in the field of science and technology.

Each country selected will be described in terms of its main policies and activities, its institutional framework, its links with the domestic scientific community, its budget and its participation in international research programmes. In some instances, illustrative examples of research activity may be included.

Except for France, scientific and technical co-operation is not an integral part of national science policy. Canada and Sweden on the other hand have established bodies specifically for research cooperation for developing countries. A number of OECD members are examining the desirability of establishing such bodies (e.g. USA). In most instances, however, scientific and technical cooperation activities are carried out in connection with the aid programme. As these programmes increasingly favor the basic needs approach, research is frequently geared for quick results and preference is often given to the applied sciences as opposed to broader more societal problems.

It is widely agreed that under ideal conditions R&D activities should be carried out in the developing countries. It is recognized, however, that the required technological know-how and skills are often available only in the developed countries.

Among OECD members, two broad approaches appear discernable. The first consists of undertaking specific research efforts on behalf of developing countries in the framework of national institutions, whereas the second emphasizes the promotion of research activities carried out in the developing countries themselves with minimal recourse to national research

1. ODA; Official Development Assistance.

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capacity. France, the UK, Australia and the USA subscribe to the first approach whereas Sweden and Canada under-write the second philosophy.

In the recently tabled Third World draft Programme of Action for UN Conference on Science and Technology for Development a section addressing this issue urges developed countries to adopt a more balanced approach. In effect while endorsing the need to change the "centre of gravity" from developed to developing countries, the paper requests developed countries to increase substantially the proportion of their R&D expenditures "devoted to specific problems of primary interest to developing countries".

New and increased efforts appear to be taking place within OECD states to integrate more closely R&D for development and national research programmes. Special advisory boards and groups on development research are one manifestation of this tendency. Furthermore, agreements and protocols have increasingly linked universities and domestic research institutions with Third World institutions.

In conclusion, it is apparent that recent international discussions and negotiations (Code of Conduct on the Transfer of Technology, the UN Conference on Science and Technology for Development, etc) have encouraged OECD member states to re-examine their S&T/R&D activities with a view to optimizing the transfer of technology to the Third World.

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CIDA

May 1979

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FRANCE

PRINCIPLES OBJECTIVES AND ACTIVITIES

French scientific co-operation policy for developing countries is based on the principle of co-operation negotiated with these countries in terms of R&D and training programmes. The purpose of this policy is to promote the growth of developing country scientific and technological potential. In planning programmes, the multi-disciplinary approach is emphasized which encompasses socio-economic concerns. It emphasizes the industrial stages of development, traditional technologies particularly in agriculture and medicine and the generation of S&T information including dissemination of findings, (eg journal abstracts etc.) Training programmes concentrate on basic training in research, methods for retraining and continuing training courses and the development of support facilities.

The policy for scientific and technical co-operation with developing countries has become an integral part of the French Plan for Economic and Social Development and consequently it is a major aspect of the national research programme, (Seventh Plan 1976-1980). Joint committees at the interministerial level review on an annual basis the current and proposed programmes for scientific cooperation. Such joint committees underline the importance attached to truly cooperative programmes which are actually negotiated rather than imposed. Agreements are expressed by protocols between corresponding research units. In recent years French policy has been to diversify on a geographical basis to include more non French-speaking areas. A new emphasis is being accorded research in the human sciences with particular attention paid to urban and environment problems.

STRUCTURAL FRAMEWORK

There are three components to the national system for co-ordinating French research. At the political level an Interministerial Committee for Scientific and Technical Research is chaired by the Prime Minister. At the Scientific level, an Advisory Committee on Scientific and Technical Research consisting of scientists reviews and seeks to coordinate efforts. At the scientific, administrative and financial levels the Délégation générale à la recherche scientifique and technique supports the work of the other two bodies. An Advisory Committee for co-ordinating co-operative research has recently been established. This body assists in formulating French policy for scientific co-operation with developing countries.

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This is a cooperative venture at 23 research stations located throughout the various rainfed areas of India. Canada contributes 5 scientists to the coordinating group, laboratory and field equipment, and training in Canada for Indian scientists and technicians. India contributes counterparts to the coordinating group, laboratories and experimental fields, and 230 scientists plus needed technicians at the 23 research stations.

2. Triticale Research

Triticale is a new hybrid cereal grain resulting from a cross between wheat (Triticum) and rye (Secale). As nutritious as traditional cereal grains it is far hardier and thus able to be cultivated in land such as the Andean, North African and Mediterranean high plateaux unable to sustain wheat production.

In 1971 IDRC initiated a major cooperative research venture between CIMMYT (an international agricultural research centre in Mexico) and the Universities of Manitoba and Guelph.

The aim of the project has been to produce a highly nutritious cereal grain that would outperform traditional grains in terms of yield and hardiness.

Because the Mexican research centre has a large and diverse pool of wheat genes and an international network of collaborating plant scientists, it has concentrated on developing and testing a wide spectrum of new genetic combinations of triticales. The University of Manitoba has concentrated more on developing new techniques for increasing the number of viable crosses, looking for genotypes that are less sensitive to day length and for other characteristics such as cold tolerance and resistance to smut and rust diseases. Plant scientists at Manitoba also deal with the more fundamental problems related to infertility and shriveled seed.

Varieties produced have now been tested in more than 50 developing countries as part of their national programs. Yields and protein contents as high as more traditional wheat cereals have been obtained in areas in which wheat could not be economically grown. Some of these varieties would be suitable for growth in Canada and indeed several are already being used in the U.S.A.

3. Cooperative Wheat Breeding Program with Brazil

Brazil had established and staffed a wheat breeding research station at Passo Fundo in the southern wheat producing

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whether the development of new technologies, adapted to the developing countries' needs, or the adjustment of conventional technologies should be carried out in developing countries or in Germany. While the BMZ establishes the technological need of specific countries, the BMFT determines whether the technological pre-requisites for the execution of the project exist and where the know-how is available. The project itself is then carried out by the Agency for Technical Cooperation (GTZ) together with the relevant institution indicated by BMFT.

FINANCIAL RESOURCES

In 1976 approximately $10 million was apportioned from the BMZ budget for research activities abroad and in Germany.

LINKS WITH THE SCIENTIFIC COMMUNITY

A programme has been established between BMZ and the German Research Association to support co-operation between researchers in Germany and in developing countries. In addition the Advisory Committee on Research and Technology (BAFT) operates to advise the BMFT. This Committee has taken a special interest in S&T as related to developing countries.

SUPPORT FOR INTERNATIONAL RESEARCH PROGRAMMES

Germany contributes to the Consultative Group on International Agricultureal Research and to the UN University.

JAPAN

PRINCIPLES, OBJECTIVES AND ACTIVITIES

A recent white Paper on Science and Technology (1977) noted that it is fundamental in Japan's cooperation with developing countries, to strengthen the science and technology base of those countries and to develop the capability which will enable them to develop their societies and economies themselves. In addition it has become increasingly important to promote research cooperation based on a comprehensive and long-term perspective.

The main areas of Japanese activity have included the use of local building material, research on geological structures, processing of tropical vegetables as well as meteorological standards and mine safety. Japan gives high priority to cooperative research program

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mes which include multiple cropping, mechanization for rice growing and improvement of sylviculture technologies. Surveys having a high scientific compoment are carried out under the Japanese aid programme, (eg hydro-electric resource development, mineral deposits). The training of scientists and research personnel from developing countries is carried out extensively and, finally, considerable attention is given to S&T institution building in the developing countries.

INSTITUTIONAL FRAMEWORK

The Institute for the Transfer of Industrial Technology (ITIT) has responsibility for R&D cooperation with developing countries. It is an integral part of the Agency for Industrial Science and Technology (AIST) which is under the responsibility of the Ministry of International Trade and Industry. The planning, programming and managing of the projects are carried out at the Office for International R&D Cooperation in AIST. The ITIT has full access to 16 national institutes and laboratories which are financed by AIST.

The Japan International Cooperation Agency (JICA) carries out scientific and technological cooperation with developing countries in connection with its technical cooperation. The Tropical Agricultural Research Centre (TARC) established in 1970 operates under the Ministry of Agriculture and Forestry. The basic principle of the research programme is to work together with scientists working with developing countries (eg Tropical Medicine, metals, Chemical Research etc.).

SUPPORT FOR INTERNATIONAL RESEARCH PROGRAMMES AND INSTITUTIONS

Japan contributes to various international programmes among which are the Consultative Group on International Agricultural Research, The International Centre of Insect Physiology and Ecology, the UN University, etc.

THE NETHERLANDS

PRINCIPLES, OBJECTIVES AND ACTIVITIES

For the Netherlands Government the objective of research for the developing countries is to overcome obstacles to development and remove bottlenecks which impede the economic progress of large sectors of the population. Emphasis is placed on an integrated approach to development and research.

New science policy guidelines aim at developing a more efficient, integrated and socially relevant programme. Cooperative research efforts are directed to basic needs problems for the poor including food, clothing, housing, health and education.

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Priority is given to strengthening the indigenous S&T capacity of the developing countries. Emphasis is also placed on research which has particularly wide applicability. Training of researchers from developing countries is given considerable importance. An extensive and cooperative programme with Dutch Universities is carried out (1976, $2.7 million) to develop links with universities in the developing countries. An active fellowship programme is supported.

In 1970 the Netherlands Universities Foundation for International Cooperation (NUFFIC) was established to coordinate programmes between Dutch Universities and institutions in developing countries. In 1976 it was determined that more development related research ought specifically to be encouraged. More specifically it was noted that the budget for development cooperation is not a research budget. Its purpose is not for funding researchers at home. This socialisation of research means that all domestic research bodies should make room within their own budget for development research. It does not mean getting extra funds but rather reconsidering existing policies.

TOOL was established by The Dutch authorities to bridge scientific knowledge in developed countries and the practical problems in developing countries. TOOL derives a large part of its budget from the Ministry for Development Cooperation which monies are spent for home-based as well as field projects.

INSTITUTIONAL FRAMEWORK

The Minister for Science Policy is broadly responsible for coordinating R&D policy. In respect of research for developing countries, the Minister for Development Cooperation is responsible. An Advisory Council on Development Research is the most important consulting mechanism and makes recommendations to the Minister for Development Cooperation. The Council comprises members from other ministries, universities and other scientific research institutions.

Under a special accord between the ministries for Development Cooperation and Agriculture a significant portion of the agricultural research facilities will be committed exclusively to research for developing countries financed from the aid budget.

SUPPORT FOR INTERNATIONAL PROGRAMMES

The Netherlands support the WIPO Special Programme for Research and Training in Tropical Diseases and the Consultive Group on International Agricultural Research.

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SWEDEN

PRINCIPLES AND OBJECTIVES

Broadly speaking, the overall objective of Sweden's support for development research is to promote research that can facilitate a self-reliant development towards the fulfillment of the basic needs of the majority of the people of developing countries. As early as 1975 it was clearly stated that the general principles for Swedish development assistance should also apply to the field of research. Developing countries are to play a central rôle by identifying research needs and specific projects. While these projects should be carried out, whenever possible, by institutions and researchers in the developing countries, when required, Swedish researchers or research institutions should be utilized in cooperation with Third World counterparts.

Sweden emphasizes the necessity to strengthen indigenous research capacity with particular attention to the poorer countries. In addition it seeks to improve Third World access to research results. No special sectoral priorities have been established for assignment of research funds rather the particular needs of developing countries determine these sectors.

INSTITUTIONAL FRAMEWORK

The Swedish Agency for Research Cooperation with Developing Countries (SAREC) established in 1975, is a high-level advisory body comprised of scientists, members of parliament and senior government officials. Its mandate is to advise the Government on the programme of research financed from Swedish aid funds; to process research projects and programmes 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 programmes and to follow the programmes of international organizations and institutions for science and technology in other countries. In FY 1976/77 allocations for research and research cooperation within the Swedish aid budget were $18 million whereas planned increases for 1978 and 1979 are $23 million and $26 million respectively. The main part of SAREC's support for research is through contributions to international organizations (ie WHO research on human reproduction and through CGIAR). A growing share of SAREC's resources will be made available to support national research systems.

SAREC's support is also given to domestic research councils and institutes. This support is available in Sweden to promote a readiness to cooperate with developing countries; to build up capacity in Sweden for evaluating and preparing research projects; and to reinforce the efforts of research councils and universities in their development oriented research efforts.

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SUPPORT FOR INTERNATIONAL RESEARCH PROGRAMMES

A considerable portion of Swedish aid funds is channelled through the research programes of international organization as follows: Consultative Group for International Agricultural Research, the WHO Research Programme on Human Reproduction, the WHO Special Programme for Research and Training in Tropical Diseases, the WHO research on nutritional problems, parasitic diseases and strengthening of health services in developing countries, the International Foundation for Science (IFS) and the International Centre for Insect Physiology and Ecology in Nairobi.

UNITED KINGDOM

PRINCIPLES AND OBJECTIVES

S&T Cooperation policy with developing countries is directed to the needs of the poorest communities of the poorest developing countries. This policy is based on three fundamental premises as follows: the work must be directed to gathering new knowledge or developing new techniques directly related to the needs of developing countries; the knowledge or techniques concerned should be capable of practical application within a reasonably limited period; and the problem in question should be either global or regional or work if at present the concern of a single country, of clear potential relevance to other countries or regions.

The research projects accepted for funding may be carried out in the developing country in Britain or partly in each. Special emphasis is accorded the rural sector.

Domestic UK R&D resources are applied through research teams of British specialists working on specific problems in developing country institutes; through an R&D network of British specialized units and through British Universities. More emphasis is given to applied than fundamental research. From a sectoral point of view the main priorities are the fields of agriculture and public health.

INSTITUTIONAL FRAMEWORK

The Ministry of Overseas Development (ODM) administers the entire aid programme including programmes for scientific and technological cooperation. R&D projects are analyzed by ODM Research advisers in consultation with other experts in the field.

Funds for S&T/R&D projects derive primarily from the aid programme although Universities, Research Councils and Foundations are active in this area.

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In addition the ODM supports various divisions of institutions under the supervision of other Ministries, eg the Overseas Unit of the Transport and Road Research Laboratory, the Overseas Division of the Building Research Establishment, the Overseas Unit of the Hydraulics Research Station and the Overseas Division of the Institute of Geological Sciences.

Support is also accorded certain non-government organizations in these areas such as the Centre for Tropical Veterinary Medicine, the Overseas Department of the National Institute of Agricultural Engineering and the Commonwealth Forestry Institute.

Within the Ministry of Agriculture the Pest Infestation Laboratory and the Terry Research Station (fisheries) receive ODM support for R&D work relating to developing country problems. An Advisory Board for Research Councils, (Agriculture, Natural Environment, Medical, Science and Social Science), coordinates research on behalf of developing countries. These Councils receive ODM funds. There exist other British research institutes dealing with tropical medicine such as the National Insititute for Medical Research, the Clinical Research Centre, and the Dunn Nutrition Unit.

The Welcome Trust supports significant research on tropical diseases particularly through a Kenyan research laboratory.

A new programme being developed is to promote intermediate technologies concentrating on development, production and marketing problems. ODM subsidies may be granted directly to private firms and voluntary organizations both in Britain and the developing countries ($1 million 1979).

The ODM considers that it is important to maintain the involvement of the British scientific community. Many universities have a long standing interest in research projects of relevance to developing countries. Frequently they budget from their own funds for these projects. No mobilizing or coordinating machinery exists for these efforts.

SUPPORT FOR INTERNATIONAL PROGRAMMES

Britain contributes to the Consultative Group on International Agricultural Research (CGIAR) and the WHO Programme for research and training in tropical diseases among other projects.

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UNITED STATES

POLICIES AND OBJECTIVES

American support to S&T cooperation programmes is funded through the Foreign Assistance Act of 1973. Activity in this area has emphasized the basic needs strategy. The main objectives of AID's R&D efforts are to mobilize the best American scientific and technological capabilities for problem solving tasks and creating a pool of ready expertise for field use and to discover solutions to current and future LDC problems within the framework of AID programme objectives.

INSTITUTIONAL FRAMEWORK

AID has the primary responsibility for S&T cooperation activities. It supports technical assistance implemented by other agencies of government. The Technical Assistance Bureau (TAB) utilizes Universities, public agencies and private counsultants in these activities.

The Office of Science and Technology within TAB acts to select and apply advanced technologies in critical sectors. It acts to identify new S&T systems which may solve the problems of developing countries and it supports the creation of new technologies. TAB has agreements with 200 institutions including 70 US universities and 32 Federal bureaux.

Many Departments (Energy, Agriculture, Environment etc) are supported with AID funds in cooperative programmes. AID receives advice on research projects from a Research Advisory Committee. The US is also considering a new body which would in some respects parallel the Canadian IDRC.

MAIN ACTIVITIES

The greatest amount of research funding is directed to the area of food and nutrition followed by population, and health. Most of the research is carried out in U.S. universities. In addition to this concentration, considerable emphasis is placed on strengthening S&T capabilities within developing countries, assessing natural resource potential, standards and information systems. AID is authorized to use up to $10 million each year to assist research and educational institutions in the United States for the purpose of strengthening their capacity to develop and carry out programmes concerned with the economic and social development of less developed countries. Title XII of the Foreign Assistance Act recognizes the significant rôle of research, training and extension activities as a key factor in promoting agricultural development abroard.

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As an independent and private institution the National Academy of Sciences (NAS) advises on matters pertaining to S&T. The Board on Science and Technology for International Development, (BOSTID), funded by AID, serves to strengthen national science and technolgoy policies and organizations in the developing countries.

VITA, (volunteers in Technical Assistance), comprises about 600 professionals who donate free services in devising technologies appropriate for developing countries.

A new section under the Act has authorized AID to undertake new efforts in the field of intermediate technology. $20 million dollars have been budgeted for the period 1976-78 to promote such technologies through American universities, private business and voluntary organizations.

SUPPORT FOR INTERNATIONAL PROGRAMMES

The US supports various international programmes such as the Consultative Group on International Agricultural Research and the Science and Technology Programme of the Organization of American States.

SECTION III

IDRC Projects by Canadian Performers

INTERNATIONAL DEVELOPMENT RESEARCH CENTRE

R&D Projects - Canadian Performers

Project No.	Project Title	Performer	Completed
P-71-0039	Osmotic Dehydration of Food	Food Research Institute Federal Department of Agriculture	X
P-71-0020	Bread & Other Cereal Foods From Composite Flours	University of Manitoba	X
P-71-0019	Development of Rural Grain Milling Systems	University of Guelph	X
P-72-0101	Drought Resistance	University of Laval	X
P-72-0126	Trypanosomiasis	University of Guelph	X
P-73-0069	Gonadotropin	University of British Columbia	X
P-73-0032	Food Legume Utilization	University of Saskatchewan, Saskatoon	X
P-73-0051	Food Legume Processing	National Research Council, Prairie Regional Laboratory	X
P-73-0113	Bovine Diseases	University of Guelph	X
P-74-0026	Winter Triticale	University of Guelph	
P-73-0129	Drought Tolerance	University of Saskatchewan, Saskatoon	
P-74-0040	Composite Flours - Phase II	University of Manitoba	X
P-74-0107	Drought Resistance - Phase II	University of Laval	X
P-74-0019	Sorghum/Maize Hybrid	National Research Council	
P-75-0094	Cassava Microbiology	University of Guelph	X
P-73-0032	Food Legume Utilization (Supplementary 1)	University of Saskatchewan Saskatoon	X
P-74-0168	Food Legume Processing - Phase II	National Research Council	
P-75-0103	Fish Pituitary Extracts	B.C. Research Council	X

Projects No.	Project Title	Performer	Completed
P-75-0040	Bovine Diseases - Phase II	University of Guelph	X
P-73-0063	Plant by Plant Interactions	University of British Columbia	
P-76-0061	Fish Nutrition	University of Victoria, B.C.	
P-76-0148	Winter Triticale - Phase II	University of Guelph	
P-76-0149	Triticale	University of Manitoba	
P-74-0107	Drought Resistance - Phase II (Supplement I)	University of Laval	
P-76-0120	Cassava Microbiology - Phase II	University of Guelph	
P-74-0107	Drought Resistance - Phase II (Supplementary 2)	University of Laval	
P-77-0081	Winter Triticale - Phase III	University of Guelph	
P-78-0008	Sorghum/Millet Milling & Quality	National Research Council	
P-72-0017	Collaborative Fertility Research (Canada)	National Committee for Fertility Research, University of Montreal	X
P-75-0132	Fertility Research (Canada)	National Committee for Fertility Research, University of Montreal	
P-76-0035	Innovative Hand Pump Technology	University of Waterloo	X
P-76-0109	Manually Operated Low-lift Pump Prototypes	University of Waterloo	X
P-76-0158	Water Pump Systems (Canada)	University of Waterloo	X
P-77-0020	Pump Windmill Systems	University of Waterloo	X

P-71-0010	Arabic Script Processor	University of Montreal	X
P-72-0050	Industrial Extension Service (SE Asia & Canada)	National Research Council	X
P-72-0005	Oysterculture Bibliography	International Development Research Centre	X
P-72-0059	Development Reference Service (SID)	International Development Research Centre	X
P-75-0060	Health Care Bibliography	International Research Centre	
P-75-0121	ISIS Outreach	International Development Research Centre	
P-75-0126	LANDSAT TN2	Laurentian University, Sudbury	
P-75-0134	DEVSIS: Canada	International Development Research Centre	
P-75-0105	Minicomputer Development (ISIS)	International Development Research Centre	
P-72-0050	Industrial Extension Service (SE Asia and Canada) (Supp. 1)	National Research Council	X
P-76-0063	LANDSAT Bangladesh	University of Guelph and Purdue	
P-76-0093	AGRIS Trouble-Shooters	International Development Research Centre	
P-76-0092	Multilingual Agricultural Thesaurus	International Development Research Centre	
P-76-0156	Low-Cost Technology Option for Sanitation	University of McGill Low-cost housing group	
P-75-0059	Development Reference Service (SID) (Supp. 1)	International Development Research Centre	
P-76-0146	Health Care Bibliography - Phase II	International Development Research Centre	

P-77-0015	Apicultural Bibliographies	University of Guelph	X
P-77-0151	ISIS Outreach & Future Systems	International Development Research Centre	
P-77-0152	Industrial Extension Services	National Research Council	
P-77-0151	ISIS Outreach & Future (SUpp. 1)	International Development Research Centre	

Source: Computer Centre, International Development Research Centre, April 1979.

Note: The above list does NOT include R&D projects in the social sciences nor expenditures in the Senior Vice-President's office in support of Canadian foundations and the fellowships program.

SECTION IV

CIDA: R&D Projects on which disbursements were made in financial year 1977/78.

NOTE

CIDA does not need to hold centrally in its management information system details of the research element of its projects. Data for the study had, therefore, to be obtained by a lengthy review of selected files. Even when a research element was identified, the judgment as to whether it justified a place on the list of projects was a subjective one for which the author takes full responsibility. It is for instance open to question whether a Canadian scientist seconded to help build up an LDC university should be classified as far as the study is concerned as doing research or not.

Several CIDA officials kindly gave their time to helping the identification process. The author's gratitude is particularly due to David Viveash and Glenn Mellis of the Policy Branch, King Tse of the Comptrollers Branch and to George Dion and the advisors of the Resources Branch.

CIDA

RESEARCH PROJECTS ON WHICH DISBURSEMENTS WERE MADE IN FINANCIAL YEAR 1977/78

	Recipient Nation	Sector	Project Name	1977/78 Disbursement ($ Cdn Million)	Research In LDC	Research In CDA	Canadian Performers
1.	Peru	Agriculture	CRTALM: Recherche sur le blé et l'orge	0.126	x		None: CYMMT
2.	Peru	Natural Resources	TELEDETECTION	0.171	x	x	Federal Gov't EMR/CCRS
3.	Peru	Agriculture	COLZA II	0.141	x	x	Alberta U.
4.	Peru	Fisheries	Recherche - Anchois	0.476	x	x	Dept. of Fisheries Dalhousie U Guelph U
5.	Brazil	General	Canada/Brazil S and T Exchange Agreement	0.210	x	x	Individuals
6.	Brazil	Agriculture	Assistance Technique En Agronomie (Education Program Building)	Minor Researches	x	x	Toronto U Waterloo U
7.	Brazil	Fisheries	Pêcherie CEARA	0.048	x		Individuals
8.	Brazil	Agriculture	Appui au Centre National de recherche sur le blé	0.016	x	x	Dept. of Agriculture
9.	El Salvador	Fisheries	Développement des Pêcheries de l'eau douce	0.013	x		Freshwater Institute of Fisheries Research Board

CIDA

RESEARCH PROJECTS ON WHICH DISBURSEMENTS WERE MADE IN FINANCIAL YEAR 1977/78

	Recipient Nation	Sector	Project Name	1977/78 Disbursement ($ Cdn Million)	Research In LDC	Research In CDA	Canadian Performers
10.	Barbados	Agriculture	Uplands Sugar Mill	2.145	x	x	Industry
11.	Barbados	Agriculture	Uplands Sugar Mill (Phase II)	0.163	x	x	Industry
12.	Jamaica	Agriculture	Jamaica Sugar Research Institute	0.078	x	x	McGill U
13.	Jamaica	Agriculture	Bovine Fertility	0.54	x		Dept. of Agriculture
14.	Kenya	Medicine	Faculty of Medicine, Nairobi University	Minor Research	x		McGill U
15.	Kenya	Agriculture	Wildlife Disease Transmission	0.537	x	x	Guelph U
16.	Tanzania	Agriculture	Beekeeping	Minor Research	x		Guelph U
17.	Tanzania	Agriculture	Wheat Research	0.862	x		Dept. of Agriculture
18.	Zambia	Agriculture	Wheat Appraisal	1.843	x		Saskatoon Wheat Pool
19.	Cameroun	Medicine	Grandes Endemics	Minor Research	x		Individuals
20.	Niger	Agriculture	Protection Vegetaux	Minor Research	x		Individuals

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RESEARCH PROJECTS ON WHICH DISBURSEMENTS WERE MADE IN FINANCIAL YEAR 1977/78

	Recipient Nation	Sector	Project Name	1977/78 Disbursement ($ Cdn Million)	Research In LDC	Research In CDA	Canadian Performers
21.	Haute Volta	Agriculture	Protection Vegetaux	Minor Research	x		Individuals
22.	India	Agriculture	Drylands Agriculture	2.737	x	x	Dept. of Agriculture
23.	Sri Lanka	Agriculture	Honey Production	Minor Research	x		Guelph U
24.	Sri Lanka	Agriculture	Dry Zone Agriculture	0.008	x		Dept. of Agriculture
25.	Colombia	Agriculture	Food Technology	0.277	x		Dept. of Agriculture
26.	Belize	Agriculture	Milpa Agriculture Research	0.003	x	x	Carleton U
27.	Bangladesh	Industry	Jute Plastic	0.086			None (Inter-Pares)
28.	St. Lucia	Energy	Wind and Solar Energy	0.013	x	x	Guelph U

SOURCES: - CIDA internal project files.
- CIDA, Comptrollers Branch.