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STRENGTHENING LINKAGES BETWEEN CANADIAN
RESEARCH INSTITUTIONS AND THE INTERNATIONAL
AGRICULTURAL RESEARCH INSTITUTIONS



Prepared for IDRC
by
W. E. Tossell
Program for Food
Security Research
University of Guelph
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1. SUMMARY

The purpose of this paper is to explore the possibilities for strengthening links between Canadian research institutions and the CGIAR Centres and non-CGIAR centres. The Canadian Institutions are the universities, Agriculture Canada and the Plant Biotechnology Institute of the National Research Council.

Canada's Current Involvement with the Centres.

1. Canada is a major donor to the CGIAR System.
2. Canadians are well represented in numbers and play a significant role on the Boards of both the IARCs and non-CGIAR Centres.
3. There are relatively few Canadians on the scientific staff of the Centres.
4. Canadians essentially are not participating as postdoctorals or visiting scientists.
5. Few Canadians participate in thesis research programs at the Centres.
6. There is a modest but significant amount of collaborative research most of which is funded by IDRC.

Greater Involvement of Canadian Institutions.

1. The Centres consider collaborative research valuable and increasingly essential to the accomplishment of their objectives.
2. Canadian universities, Agriculture Canada and the NRC Plant Biotechnology Institute have expertise and special resources in a range of subjects appropriate to collaborative research with the IARCs.
3. Canadian Institutions and researchers are interested in more collaboration with the Centres.
4. Lack of adequate and easily accessible information on collaborative

opportunities is a major constraint to the amount of interaction.

Major Suggestions.

Canada has been a major supporter of the CGIAR Centres and non-CGIAR centres through provision of funds but has not made an equivalent contribution of its scientific resources in support of Centre programs. Centres have expressed an increasing need for such scientific support and Canadian Institutions welcome more opportunity to participate. Now is an appropriate time for Canada to review the role it wishes to play during the decade ahead and to develop and promote mechanisms to accomplish it. The major suggestions advanced to strengthen collaborative linkages and activities are:

1. that CIDA and IDRC in conjunction with the universities, national research organizations and the private sector review the Canadian institutional capacity for international development activities in agriculture and food in relation to projected need and the mechanisms to assure an appropriate capacity.
2. that CIDA or IDRC initiate a Visiting Scientist Program for Canadian university faculty to undertake collaborative research at the IARCs and non-CGIAR centres.
3. that IDRC and CIDA attempt to increase the participation of Canadians as Postdoctoral Fellows at the Centres by one of the following options:
 1. Monitor the number of Canadian applications for PDF positions at the Centres during the next three years to determine if an improved information system solves the current problem of essentially no participation as PDFs. If not a Postdoctoral Fellowship Program should be established

2. Introduce a PDF Program now with high visibility to encourage participation immediately. Five new postdoctoral fellows per year for two year tenure would provide 10 PDFs at a moderate program cost.
4. that CIDA and IDRC jointly prepare and distribute an information package on opportunities for graduate thesis research at the CGIAR Centres and non-CGIAR centres consolidating descriptions of the CIDA and IDRC programs and other opportunities.
5. that an IDRC strategy of clustering projects around a limited number of priority topics is appropriate for the Cooperative Program between Canadian institutions and developing country universities or NARS, but a strategy of less rigorous clustering with the project portfolio more Centre-driven is more appropriate for the Centre-related component of the Cooperative Program.
6. that in Cooperative Program projects with the Centres IDRC adopt a policy with flexibility to include in some agreements a salary component to provide the university with funds to release the scientists for enough time for the project.
7. that the Centres be invited to provide a list of priority research or research-related topics for wide distribution at least annually to the Canadian science community using a communication list and system carefully designed to reach the appropriate scientists.
8. that the CNC with office support from IDRC assume responsibility for developing an integrated plan to provide information to the Canadian science community on collaborative needs and opportunities with the Centres and include in it the following components and others as appropriate:

- i. A brief publication consolidating information on all collaborative opportunities.
- ii. An annual list of collaborative research topics supplied by the Centres.
- iii. Encouragement for and assistance in arranging information sessions at universities for scientists at the university and in the region.

STRENGTHENING LINKAGES BETWEEN CANADIAN RESEARCH INSTITUTIONS AND INTERNATIONAL AGRICULTURAL RESEARCH INSTITUTIONS

2. INTRODUCTION

The global agricultural research system includes the following major elements:

- i. National agricultural research system and national extension system.
- ii. Universities in developing countries.
- iii. Regional research institutions.
- iv. International agricultural research centres (IARCs, Centres) of the CGIAR System and non-CGIAR centres.
- v. Networks linking combinations of the four elements above.
- vi. Advanced research institutions in industrialized countries.
- vii. Private sector research.

Advanced research institutions in industrialized countries represent a major resource in the global system to contribute to the improvement of food security in developing countries. This element contains a mass of special expertise, equipment and knowledge of special techniques and provides opportunities for specialized training and consultation that can be utilized in a cost effective way to meet specialized needs of developing country research institutions.

Advanced research institutions can link productively with each of the first four elements and often with element five in the global system. Thought needs to be given to arrangements to facilitate and encourage such linkages in each category.

The purpose of this paper is to explore the possibilities for strengthening links between Canadian research institutions and the

International Agricultural Research Centres (IARCs, Centres) of CGIAR System and non-CGIAR centres.¹

The analyses and discussion are focused on the IARCs. The non-CGIAR centres were added late in the preparation of the paper hence data and views from these are incomplete. It is expected, however, that the conclusions related to the IARCs would apply in general terms to the non-CGIAR institutions.

Universities, research units of Agriculture Canada and the Plant Biotechnology Institute (PBI) of the National Research Council are the Canadian research institutions considered in this paper.

Suggestions are advanced for the consideration of IDRC and CIDA. These were identified and developed at a workshop comprising individuals with experience in the CGIAR System from Canadian faculties of agriculture, IDRC, CIDA, IARCs, non-CGIAR centres, Agriculture Canada and the PBI. In addition, views were invited from the Directors of the CGIAR Centres and from the Deans of Agriculture and Veterinary Science in Canada.

1. non-CGIAR centres: AVRDC, IBSRAM, ICIPE, ICLARM, ICRAF, IFDC, IIMI, INIBAP

3. CANADA'S CURRENT INVOLVEMENT WITH THE IARC'S

3.1 Funding

Canada has been a major and consistent donor to the core budget of the CGIAR System since its establishment (Annex 1). In 1985, the most recent year for which full data are available for the CGIAR System, CIDA provided US \$12.74 million of which 9.7 was core from Multilateral and 3.04 was for special projects funded by Bilateral (Table 1). The IDRC contribution of US \$3.12 million was all project related of which 1.30 was assigned to restricted core and the balance to special projects. This is in conformity with IDRC's general policy of allocating its resources to specific projects related to the priorities of IDRC.

TABLE 1. TOTAL CANADIAN CONTRIBUTION TO THE 1985 BUDGET OF THE CGIAR CENTRES (US MILLION)

	<u>Core</u>	<u>Non-Core</u> ²	<u>Total</u>
CIDA	9.70	3.04	12.74
IDRC	1.30 ¹	1.82	3.12
Total Canadian Contribution	11.00	4.86	15.86
Total from all donors	170.17	39.64	209.81

1. restricted core

2. special projects

Source: 1985 CGIAR Annual Report

The Canadian contribution directly from CIDA and IDRC to both core and non-core budget of the Centres is approximately 16 million US which represents 7-8 percent of the total budget.

Substantial additional Canadian funds are provided to the Centres by donors that Canada supports financially through the multilateral channel.

Canada also provides core and/or special project support to most of the non-CGIAR centres.

3.2 Scientific Staff at the Centres

The number of Canadian scientists at the Centres is modest (Table 2). Thirteen are listed on staff in 1986 which represents approximately two percent of the senior staff in program and management positions. Two are at the Deputy Director level, two in the Program Leader category and 13 senior scientists. Many of the scientists are on special projects.

TABLE 2. NUMBER OF CANADIANS AT THE CENTRES IN 1986

	<u>CGIAR Centres</u>	<u>Non-CGIAR centres</u> ¹
Centre Management ²	4	
Senior scientists	13	3
Postdoctorals	0	
Students: Masters thesis	4	
Students: PhD thesis	2	
Visiting scientists ³	1	
Consultants to Centre	6	

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1. data on IBSRAM and ICRAF only
 2. program leaders and above
 3. six months or more at the Centre
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Of great concern is the fact that there are no Canadians in postdoctoral positions and only one as a visiting scientist.

These categories are extremely important in building long-term linkages and for developing experienced Canadian scientists who might hold future positions in the Centres or in related international research. Similarly the number of Canadian graduate students with their thesis research at the Centres is small.

3.3 Participation in Boards

In contrast to the number of Canadians in the scientific programs of the Centres, Canadians have been active in Boards, for example participation in 1986 was as follows:

CGIAR Centres

CIMMYT	Solandt, Omond	Member Executive and Finance Committee
CIAT	Tossell, William	Chairman
IBPGR	Bishop, Charles	Member, Program Committee
ICRISAT	MacHardy, Fenton	Chairman
IFPRI	Head, Ivan	Member, Executive and Finance Committee
IITA	McGinnis, Robert	Chairman, Program Committee
ILCA	Steppler, Howard	Member, Program Committee
ILRAD	Wells, Kenneth	Chairman, Program Committee

Non-CGIAR centres

IBSRAM	Bentley, Fred	Chairman
ICRAF	Steppler, Howard	Chairman

3.4 Collaborative Research

The 22 active projects listed in Annex 2 represent a modest but significant amount of collaborative work between the Centres and Canadian institutions. IDRC is the primary funding source financing 13 of the 27 projects at a total cost of 1.1 million CAD

In 1986. Most were AFNS Division projects but the Information Sciences and Communications Divisions each had one. No projects were funded at the Centres by the Social Science Division.

Universities with 18 projects were the main collaborators. Nine universities were involved including four of the eight universities with faculties of agriculture but none of the four faculties of veterinary science. Five universities with neither a faculty of agriculture or veterinary science had projects illustrating the need to include the entire science community in considerations concerning collaborative research. Agriculture Canada participates in the remaining four projects.

None of the CIDA special projects at the Centres are collaborative with Canadian institutions (Annex 3).

3.5 Summary

1. Canada is a major donor to the CGIAR System.
2. Canadians are well represented in numbers and play a significant role on the Boards of both the IARCs and non-CGIAR centres.
3. There are relatively few Canadians on the scientific staff of the Centres in administrative and regular positions as senior scientists.
4. Canadians essentially are not participating as postdoctorals or visiting scientists.
5. Few Canadian students participate in thesis research programs at the Centres.
6. There is a modest but significant amount of collaborative research most of which is funded by IDRC.

4. GREATER INVOLVEMENT OF CANADIAN INSTITUTIONS: THE NEED AND INTEREST

4.1 Need of the Centres

Encouraging increased Canadian collaboration would be valid if such collaboration is valuable to the IARC's in advancing toward their objectives.

Historically the Centres have concentrated on applied and strategic¹ research supplemented by that basic and adaptive¹ research needed to accomplish their mission. Their common strategy is to draw on the existing world reservoir of basic and strategic research and only undertake such research themselves or arrange for it under contract with advanced institutions when the information is not available but is essential to remove a constraint in advancing their technology development programs.

Most of the commodity Centres have a significant amount of collaborative basic and strategic research. The majority of this is funded as special projects although some is financed from the core budget. CIP uses the collaborative model as a central element in its research strategy and contracts for applied as well as strategic research funded from its core budget. IBPG adopted the model of contracting out for all of its research requirements. Among the Centres with crop research programs IBPGR is unique in that its research activities centred on germplasm are less affected by location, hence a higher percentage of its research can be conducted when the scientists are now located.

The preliminary report from the study undertaken by Rudolf Binsak²

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1. see Annex 6 for definitions of the four categories of research.
 2. Cooperation Between Centers and Scientific Institutions in Europe.

on collaboration between European donors and the Centres illustrates the volume and range of activities of interest to the Centres as follows:

"Volume and Types of Collaboration

4. At the end of 1984 there were 265 projects or programs conducted in a collaborative manner. They can be subdivided into various technical topics.

5. Training and information dissemination is the largest group with 48 projects, directed primarily by ISNAR, IBPGR and WARDA. Most of these projects are regular or ad hoc organized training courses, conferences and seminars, missions and studies. The duration is normally limited to a time span between two weeks and six months, and the amount of money involved varies between a few thousand to about \$50,000 US.

6. Genetics and germplasm is the second largest group with 44 projects. IBPGR is in the lead, followed by CIMMYT and CIAT. Many of these projects deal with adequate characterization, conservation and use of genetic material (including four East European countries) and with more basic research in plant genetics (such as wide crossing techniques, polyploidy, dwarfing genes, electrophoresis technique, and inbreeding).

7. Plant protection is the next group with 42 projects where ICRISAT alone has 14 projects followed by CIMMYT and IRRI. Most of these projects focus on clarifying the relations between certain diseases caused by bacteria, fungus and virus and the factors which gave plants a resistance or at least tolerance to them. These projects include insect pest control through pheromones, neem as insecticide, and mealybug control through natural predators.

8. Plant Breeding projects number 22 and CIP leads in these. The use of native forms of crops, resistance breeding against certain pests and diseases, and the use of tissue culture are the main topics in this group.

9. Seen from another viewpoint, the last three topics can be grouped together because their overall goal is the development and use of those plant breeding techniques which provide resistance or at least tolerance to the major pests and diseases.

10. Agronomy and plant production have 22 and 21 projects respectively and in both cases are led by ICARDA. The use of marginal lands, the effects of mycorrhiza and azolla, farming systems and crop rotation, wetland utilization are main topics in these two groups which are difficult to separate.

Development of adequate plant or livestock production techniques is normally the domain of national research organizations.

11. Animal health is ILRAD's mandate and is emphasized in 17 projects. Most of them deal with the different pathogens causing trypanosomiasis, the animal sleeping disease. As relatively little is known about this cattle killing disease, a lot of basic research is being undertaken in close collatoration with European institutes. The resistance of camels and some wild animals to this disease is intensively studied in an attempt to find the responsible agent.

12. Projects in plant physiology number 10 and deal with drought physiology, root respiration, iron and phosphorus relations in plant nutrition and similar more basic questions. Development of right fertilization techniques is normally the task of national organizations.

13. Economy and food policy cover nine projects, most of them at IFPRI, dealing with such important matters as food trends and food security in Africa, cash cropping impact, social benefits and costs of rice research. Seven projects in Post-Harvest Technology and Food Processing are trying to solve cassave and sorghum-related problems and to develop improved milling techniques.

14. Some other agricultural sectors are represented with only small number of projects even though they are important as research subjects. These include: six projects in seed production, five projects in livestock production, mainly at ILCA, five projects in soil management, mainly at IITA dealing with soil erodibility, four projects in data processing, like development of computer software, two projects in agricultural mechanization and one project in Irrigation."

Generally Centres consider collaborative research important.

Both the Centres and TAC¹ project a larger volume of collaboration with advanced research institutions. Although the IARCs will need to maintain their central thrust in and strategic applied research, the complexity of the problems they are dealing with increasingly requires access to more strategic and sometimes basic research capacity.

1. CGIAR Priorities and Future Strategies. TAC Secretariat. 1987.

They have two choices: build adequate capability into the Centre structure or make increased use of the collaborative model. The first option does not seem feasible because the scope and variation in the type of the research needed will make this option extremely costly. The collaborative model has the advantage of access to the special scientific resources needed wherever they exist to work on whatever problem needs attention at a particular point in time. The specific scientific assistance needed will vary over time and the collaborative model provides the flexibility to reallocate resources quickly to deal with changing priorities.

Increasing use of the collaborative model for basic and strategic research requires also that the Centres themselves have a sufficiently deep scientific base to provide a solid bridge to the state-of-the-art science involved in basic and strategic research in the advanced research institutions. This over time will deepen the science at the Centres as recently has been the case in biotechnology and molecular biology.

The question remains of where the partners are for cooperative activities. Based on the general strategy of the Centres to conduct their programs within the framework of strengthening national research capacity, they presumably will look for partners first within the developing country institutions and this should be encouraged. Such linkages now exist. The problem is that for the very special scientific expertise needed for a specific basic or strategic research problem, the necessary expertise often is not available in developing country institutions. The same holds for the unique techniques, equipment and facilities required.

Consequently it is necessary to search for such expertise and other resources wherever they exist in the global scientific community. Canada has a share of such special expertise, facilities and equipment that could be made more available to the Centres under the collaborative model.

4.2 Interest of Canadian Institutions

a) Universities.

The successful partnerships are those in which both partners derive important benefits. Canadian universities with the increasing financial and teaching-load pressures of recent years need to concentrate their resources on the most important areas. There is no question about the advantages to the universities of involvement in international development activities to maintain the depth of experience and understanding needed for their educational, research and public service mandate. Based on the principle of comparative advantage it follows that universities would place high priority on institution building and collaborative research and lower priority, for example, as executing agents for the implementation of general development projects. Consequently participation in collaborative research with the Centres as well as with other developing country institutions, is compatible with university objectives and priorities.

Canadian Faculties and Colleges of Agriculture and Veterinary Medicine have a history of responding to opportunities for participation in collaborative research with the Centres. In the early 1970's when collaborative projects were established in cassava and triticale at CIAT and CIMMYT

with CIDA funds managed by IDRC, those Canadian universities (Guelph, Manitoba, McGill) which were asked to participate responded with enthusiasm. And when the AFNS Division under the new cooperative program, in the early 1980's, initiated projects with emphasis on grain legumes for semi arid regions the same response resulted with the University of Manitoba selected as the main participant. Currently four faculties of agriculture participate in collaborative projects with the IARCs with IDRC cooperative and regular program funding (Annex 2). And an additional three faculties of agriculture and one faculty of veterinary science collaborate with NARS and universities in developing countries in research funded by IDRC (AFNS). (Annex 4). Further, Deans of Agriculture and Veterinary Science surveyed for this paper confirmed the interest of their faculties and universities in strengthening collaborative work with the Centres. Major constraints by the Deans to the increase of collaborative activity which were identified are:

- i. Restriction on time available. Teaching load increases in recent years has reduced faculty research time.
- ii. Lack of awareness of research topics that might be of interest to IARC's and non CGIAR centres.
- iii. Uncertainty of the amount of funds available to help in deciding if faculty time is efficiently used in preparing applications.
- iv. Uncertainty of who to contact for information.
- v. Lack of awareness of graduate student, postdoctoral and

visiting scientist or staff opportunities at the Centres.

vi. Lack of resolution of the indirect cost component of collaborative research agreements.

Faculties of agriculture and veterinary science have a special interest in collaborative programs with the Centres because they, like the Centres, are mission oriented with their central focus on the food system. However, faculties of science and social sciences are increasingly important to consider. Information sciences, sociology, anthropology, chemistry, physics, engineering, molecular biology, botany, as well as other disciplines have expertise that is essential to deal with the increasingly sophisticated research needed by the Centres.

Canadian faculty in these disciplines generally are not familiar with the CGIAR System. But they are interested in international research based on their response to the new Cooperative Program introduced by IDRC in 1981. During the first four years of the program, 370 Canadian researchers in 30 Canadian institutions participated in collaborative projects with a developing country partner in a wide range of topics affecting development involving many disciplines. And this occurred in a situation where very little publicity was given to the program. There is little question that a large number of Canadian researchers would participate enthusiastically if they were presented with more information on opportunities and the arrangements are attractive. Already researchers from such disciplines at five Canadian universities participate in collaborative projects with IARCs (Annex 2).

b) Agriculture Canada.

Agriculture Canada is the largest research organization in Canada with 48 establishments across the country performing about 50 percent of the total national agricultural research. Currently it is involved in three IDRC funded collaborative projects with the IARCs (Annex 2) and an additional one with NARS in Egypt (Annex 4).

The organization is interested in collaborative work with the Centres and visualizes a number of activities in which cooperative activity with its own resources could be justified on the basis of its domestic mandate. The most likely convergence of interests for the Centres could be in midstream research, such as the application of new biotechnologies in varietal development or plant disease diagnostics and screening. Constraints identified are:

- i. Collaborative work with the Centres using Agriculture Canada resources can be undertaken only when such work is in harmony with the domestic mandate.
- ii. Projects which do not contribute to the domestic mandate but which involve Agriculture Canada staff require full funding from some other source.
- iii. More information is needed to identify collaborative opportunities.
- iv. Reentry of staff to the Agriculture Canada system after being away for a few years is a serious barrier to career progress and therefore constrains the number of Agriculture Canada scientists prepared to apply for

positions at Centres.

c) Plant Biotechnology Institute, National Research Council.

The PBI was involved in one collaborative research project with ICRISAT and ICARDA recently and in the early to mid-seventies made an important contribution to CIAT research on cassava tissue culture and cryopreservation of cassava meristems. PBI would like to continue this association with the Centres. Constraints which limit the level of collaborative activity include the following:

- i. Person-year allocation for IDRC-funded projects. The PBI has the same problem as Agriculture Canada with regard to the question of who supplies the person-years. In the past, IDRC-funded the operating needs of the project with manpower, in terms of person-year allocation, supplied by PBI. However, since 1983 because of the reduction in resources the contribution of PBI person-years to IDRC-funded projects was no longer possible but IDRC-funded work has continued using graduate students and guest workers. A mechanism is needed whereby IDRC-funded projects supply the funds for both operating and manpower requirements.
- ii. Project compatibility with the PBI mandate. Prior to 1983, PBI could be flexible in accommodating collaborative research projects. Since then, PBI's mandate directs most research toward problems of national interest. Recent budget and manpower cuts within NRC have resulted in sharper focusing of limited resources.
- iii. Information on possible research topics at IARCs and

available project funding.

- iv. Availability of qualified project personnel. Finding qualified, experienced project personnel is often difficult for PBI. It would be very helpful if IDRC and the Centres could assist in finding people in developing countries with the skills required to participate in future PBI-Centre projects.

4.3 Summary

1. The Centres consider collaborative research valuable and increasingly essential to the accomplishment of their objectives.
2. Canadian universities, Agriculture Canada and the NRC Plant Biotechnology Institute have expertise and special resources in a range of subjects appropriate to collaborative research with the IARCs.
3. Canadian institutions and researchers are interested in more collaboration with the Centres.
4. Lack of adequate and easily accessible information on collaborative opportunities is a major constraint to the amount of interaction.

5. IMPROVING LINKAGE MECHANISMS

5.1 Framework for Collaboration

Canada has been a major supporter of the CGIAR System through provision of funds. It has not made a comparable contribution of its scientific resources in support of Centre programs. Centres have an increasing need for such scientific support and Canadian Institutions welcome more opportunities to participate. Now is an appropriate time for Canada to review the role it wishes to play during the decade ahead and to develop and promote mechanisms to accomplish it.

The priority needs of the Centres must be the foundation on which Canadian collaboration is built. Consequently the normal pattern is that collaboration will occur when a Centre selects a Canadian scientist as an appropriate one for a specific project for which the Centre needs a partner. Although this model is built on Centre identification of projects requiring collaborative research, it should include an opportunity for Canadian scientists who know the Centres' programs to advance a new idea for Centre consideration when they recognize a scientific advance that might have important application. Hence under this framework most projects in the Canadian portfolio of collaborative projects with Centres at any point in time will be those identified by the IARCs and for which they were seeking partners but a few may have been advanced initially by Canadian scientists and judged of sufficient importance by the Centres to be added to their priority list. Canadian mechanisms need to be designed to operate within this framework.

5.2 A Plan for Action

A realistic appraisal of the Canadian capacity to participate more in collaborative activities with the Centres or for that matter with other elements in the global agricultural research system must first recognize the fact that the cohort of Canadians experienced in international agricultural research is very limited. Such experience is not necessary for collaborative activities such as research using specialized equipment that can be done in the laboratories of the Canadian collaborator. But where a knowledge of the commodity and its interaction with the physical, biological and social environment is important then experience in the developing country environment is important. Although Canada is a major donor of development assistance, it does not have in its society, including its scientific community, the international experience and structures from a colonial past to draw upon such as countries like the United Kingdom, France and the Netherlands. And this has not been compensated for by government funded programs to build the international capacity of its scientific units as has been done in the USA.

Consequently it is no surprise that once again in a discussion on possibilities for increasing Canadian participation in international activities the issue of a limited experienced cohort arises. The current scientific environment has accentuated the problem. University funding levels in recent years have forced high teaching loads with a corresponding reduction in research time. Faculty facing increased competition for promotion and growth in their careers and, of equal importance, increasing competition for grants from national granting councils, tend to

concentrate on research with high expectations of significant publication. National research organizations like Agriculture Canada and the PBI are under increasing budget pressures leaving less flexibility for resource allocation to international research that is not central to their domestic mandates. Another factor is the trend in CIDA toward requiring higher Canadian content in development projects which creates the need for an increasing number of high quality, experienced Canadian professionals available from universities, national research organizations and the private sector.

Attention is drawn to this issue not to present a pessimistic scenario but rather to set out the facts as they exist so realistic plans can be developed. Optimism, in fact is the overriding tone arising from discussions with Canadian institutions and scientists. They see linkages with the Centres and other international development activities as important and interesting, and they would like to participate to a greater degree. It is against this backdrop of optimism that a number of suggestions are offered.

It is the appropriate time now to rethink this complex general issue of Canadian capacity, therefore it is -

Suggested that CIDA and IDRC in conjunction with the universities, national research organizations and the private sector review the Canadian institutional capacity for international development activities in agriculture and food in relation to projected need and the mechanisms to assure an appropriate capacity.

The plan of action specifically suggested for expanding and intensifying Canadian collaboration with the IARCs and non-CGIAR centres is a broad one containing the following five elements which are discussed in the remainder of section 5:

- Visiting Scientists
- Postdoctoral fellows
- Collaborative thesis research
- Collaborative research and related activities
- Awareness and promotion

The first four are all project based, related to priorities set by the Centres and involve collaboration between Centre scientists and those in Canadian institutions.

5.3 Visiting Scientists

The starting point in developing an integrated program to increase interaction with the Centres is an arrangement that encourages Canadian visiting scientists at the Centres.

Visiting scientists are a valuable resource for the Centres because they can add special expertise to a program in a cost effective manner. Of course this is based on the conditions that the Centre needs the particular expertise and that the period of the visit is long enough to carry out the research which usually means at least six months.

Canadian scientists who spend a leave period of six months or more working at the Centres provide the foundation on which collaborative activities can be built and expanded with the IARCs, developing country universities and NARS. They know the Centres and the Centre staff know them. Communication channels are opened. The scientist upon her/his return is a resident source of

Information on the Centres and on opportunities for other scientists and students. Future collaborative research with developing country institutions is likely to grow from this linkage not only for the scientist personally but for colleagues in the institution. The university scientist probably would encourage more Canadian students to undertake thesis research at the Centres to build international experience and later to apply for postdoctoral and staff positions. In addition he/she is in a better position to supervise thesis research of both Canadian and developing country students at the IARCs and in Canada.

From discussions with Deans it appears that there is potential for a significant increase in the number of faculty members who would participate in a visiting scientist program. And this could be accomplished at relatively low cost because the visiting arrangement could be linked to sabbatical leave with the university covering the salary cost. All that is needed to capitalize on this opportunity is a funding source to cover non-salary costs for the period of the visit and information on collaborative needs of the Centres. Consequently it is -

Suggested that CIDA or IDRC initiate a Visiting Scientist Program for Canadian university faculty to undertake collaborative research at the IARCs and non-CGIAR centres.

The basic structure suggested for the program is:

1. Open to Canadian scientists who have a leave period with salary from their institution for at least six months.

- ii. The research must be that needed by the Centre.
- iii. The award would cover travel costs for the scientist and family, housing and travel to the Centre.
- iv. Centre agreement to provide local transport and research costs.
- v. Ten awards per year.
- vi. An annual budget of \$150,000 with \$15,000 per award would provide 10 awards annually with half for six months and half for twelve.

Agriculture Canada does not provide leave with salary and therefore its scientists would have to arrange leave without salary to participate as a visiting scientist on a project outside its mandate. This effectively rules out participation as a visiting scientist except for mutually important collaborative research projects discussed in Section 5.6.

5.4 Postdoctoral Fellows

The second most important element in a program to strengthen Canadian collaboration is a plan that results in a significant number of Canadian postdoctorals at the Centres. Centres are very interested in programs that support postdoctoral fellows. Such scientists who are at the forefront of knowledge can make an important contribution by undertaking a specific high priority project. They provide flexibility in that they can be moved into and out of Centre programs according to need. In addition the Centre has an opportunity to assess these young scientists with regard to future vacancies in the senior scientist complement.

Postdoctoral fellowship involvement would be welcomed also by

Canadian institutions as an opportunity to contribute to international development, build Canadian experience in Centre research, increase the number of Canadian scientists who are likely to form long-term relationships with the Centres as Centre employees or as collaborators from Canadian institutions and increase Canadian capacity to collaborate with NARS and developing country universities.

Centres employ a large number of postdoctorals, perhaps in the order of 10 to 20 in total on average per year in each commodity Centre. We understand that the competitions are open because the basic purpose is to find the best people available for the research. Canadians are eligible for consideration but in 1986 there were no Canadian PDFs at the Centres. The reasons are not clear. Probably an important or even the most important factor is lack of awareness of the opportunities. However, some suggest that the rigorous competition for career positions in Canadian science encourages PDFs to seek postdoctoral positions where there is more opportunity to derive publications than they perceive to be the case at the Centres.

Because postdoctoral positions represent such an important element in the package to increase interactions with the Centres, it is -

Suggested that IDRC and CIDA attempt to increase the participation of Canadians as Postdoctoral Fellows at the Centres by one of the following options:

1. Monitor the number of Canadian applications for PDF positions at the Centres during the

next three years to determine if an improved information system solves the current problem of essentially no participation as PDFs. If not a Postdoctoral Fellowship Program should be established

2. Introduce a PDF Program now with high visibility to encourage participation immediately. Five new postdoctoral fellows per year for two year tenure would provide 10 PDFs at a moderate program cost.

When an improved information system is operational it is important that the universities assume their share of the responsibility and fully inform possible candidates of the opportunities.

An appropriate model for a postdoctoral fellowship program is the Rockefeller program designed to provide experience for visiting research fellows in the social sciences at the Centres. This program receives excellent reports from both the Centres and fellowship holders. Some of its important features are:

- i. It is a focused program aimed at social sciences disciplines and designed for the Centres. It has visibility.
- ii. Careful selection of the people to assure high quality. The Centres know this and consequently when they would like a social scientist for a specific short-term project they are likely to contact the Rockefeller program.
- iii. Rockefeller assists the postdoctoral candidates and the Centre in finding a suitable partner and keeps in touch with the Fellow both during and after completion of the

fellowship period.

iv. Rockefeller provides a reasonable level of stipend, travel funds and a research fund in the order of US \$3,000 per year for two years. The Centres provide transportation, support services and most of the research costs.

The Rockefeller style of administration of the program is supportive to the Fellows and Centres and is highly appreciated by both. If Canada could establish a postdoctoral program linked to the Centres, perhaps it could be administered by IDRC following the Rockefeller model.

5.5 Collaborative Thesis Research Opportunities for Canadian Graduate Students.

Graduate student thesis research at the Centres, especially at the doctoral level, is attractive to the Centres as an efficient investment to accomplish the research they require. Similarly it can be valuable to the young scientist wishing a career in international research. Not only does it provide experience but it also provides visibility for an individual interested in employment at one of the Centres.

Graduate programs with the student registered and taking course work in a Canadian university with thesis research at a Centre, or a developing country university or research institute, are complex and costly in terms of both funds and time. The period of graduate study is almost always lengthened by at least one year in order to accommodate the thesis research away from the home university. And the faculty supervisor normally must spend substantially more time in supervision under the more complex

arrangement. These complexities and costs must be recognized by both the agencies in designing their financial support programs and the students in choosing such a program. However, the arrangement is an extremely valuable and needed one and good support programs are essential to make it work well. It is the preferred pathway for some students to gain international research experience and exposure. For other students the preferred path is graduate work in a Canadian university followed by a postdoctoral period at a Centre or other developing country institution, hence both postdoctoral and graduate thesis research support programs are necessary components of an integrated plan to build Canadian capacity in international development research.

A graduate research support program must meet three criteria to be successful.

- i. It must attract the very best students because this is the calibre of scientists and social scientists needed in international research.
- ii. The thesis research topic must be important to the Centre's program to justify the allocation of research resources of the Centre to the project.
- iii. The program must be widely advertized and highly visible.

Two programs are available to assist doctoral students with field research at the Centres.

a) Young Canadian Researchers Program: IDRC

IDRC initiated this program in 1982 to fund a thesis research period at a research or training institution in a developing country. Centres qualify as eligible institutions. Since 1982 assistance has been provided to 33 students for

thesis research at various developing country institutions in disciplines related to the Centres with 13 in the AFNS area, 17 in social sciences and three in communications.

The program has been undersubscribed generally. Two serious weaknesses are being corrected this year. The support period which has been up to 12 months for field research is being extended to up to two years, a much more realistic period. Also the requirement that all course work be completed by the time of tenure is being modified. These two changes are important ones that will make the program much more attractive.

b) International Agricultural Research Centres Doctoral Fellowships: CIDA

In 1987 CIDA Multilateral Technical Cooperation Division established a new pilot program of support for Canadian Ph.D. students to conduct their thesis research at the IARCs. The conditions for the awards and administrative arrangements are excellent and the specific identification of the Centres will make the program highly visible. Reaction to the new program from the Centres and from the Deans is very positive and CIDA is commended for designing and introducing an excellent new initiative. Under this plan the support period is up to two years, guidelines are reasonable and flexible with the specific arrangement for each student made between the IARC and the university, subject only to CIDA's final approval. The program makes provision for a total of six students at the Centres, three of which would be in their first year and three

in the second.

There is need for both programs. The CIDA one specifically identified with the Centres will provide six doctoral appointments. The IDRC program being open to all institutions in developing countries may or may not sponsor students at the IDRCs in any particular year. However, with the recent modifications in the program and if it is given more publicity in relation to the IARCs, a reasonable expectation is 3-6 students per year at the Centres. Consequently the two programs in total would assist 9-12 students each year which seems to be a reasonable and significant number.

There are some other very limited opportunities for graduate student experience. The IDRC Cooperative Program under which Canadian scientists may conduct collaborative work with the Centres provides an opportunity for graduate student involvement as research assistants. In addition, IDRC reserves five of the Young Canadian Research Awards per year for Cooperative Program participants in developing country institutions.

Another limited possibility for support of Canadians for a Master's thesis research project is the CIDA Awards Program for Canadians. This is not designed for support of graduate students or academic research but offers possibilities in a few special situations. It is designed to assist Canadians in gaining experience with applied field projects in developing countries. Approximately 18-20 awards are made annually for a one year period with a possible extension to two years. Because the maximum stipend is \$15,000 CAD for one year, most applicants are young Canadians. It appears that occasionally an award might be made

for a field project away from headquarters that also would be suitable for a Masters thesis. However, because of the limited numbers of awards spread across all fields and the restrictions on type of project, this program is not a significant factor in collaborative efforts with the Centres.

The major problem with the revised IDRC Young Canadian Researchers program and the same will be the case for the new CIDA program is the restriction of support essentially to the thesis research period within the total program of the student. This means that the student must find other support for most or all of the residence period. It would be ideal if these programs could follow the NSERC Scholarship Program procedure which offers stipend support for the full graduate period and this certainly would attract the attention of Departments and students to a greater degree. However, the position of IDRC and CIDA is that the limited amount of funds can be distributed to a larger number of students if only the thesis research period is covered. This approach leaves with the Departments and the students the problem of organizing funds for the residence period to combine with the IDRC or CIDA fellowship. Such funds are limited in Canadian universities where most of the research funds that support graduate students are in the form of grants and contracts in which the research is tied to the topic of the fund source.

Deans and all faculty consulted consider this problem of partial support for the graduate period a serious handicap to the programs. Consequently the success of the revised IDRC and new CIDA doctoral programs should be determined carefully during the

next three years to determine if the two year tenure limit turns out to be a serious barrier.

There is need for higher visibility of opportunities for graduate study in collaboration with the Centres. It is -

Suggested that CIDA and IDRC jointly prepare and distribute an information package on opportunities for graduate thesis research at the CGIAR Centres and non-CGIAR centres consolidating descriptions of the CIDA and IDRC programs and other opportunities.

Such a package would draw attention to the Centres, would alert the student to all possible sources of support including not only the CIDA and IDRC programs but also such possibilities as linkage with an IDRC Cooperative Program project and the feasibility of thesis research at the Centres for NSERC scholars, and would indicate the contact point for identification of Centre partners.

5.6 Collaborative Research Projects and Related Activities.

IDRC is commended for its initiative in establishing the Cooperative Program in 1981. This has created a base of experience for use in refining the program as it enters an era of growing demand. A significant block of funds is also in place. For example, in 1986 the AFNS Division Cooperative Program expenditures were 3.5 million CAD of which 31 percent went to collaborative projects with the Centres. In addition collaborative projects of high priority within the AFNS areas can be funded from the regular program budget and cooperative projects also can be funded by other IDRC Divisions.

Collaborative research as referred to in this paper is

research that is jointly planned, agreed upon and executed by both parties, the Centre and the Canadian institution. Some of the past research classified under the collaborative heading would not meet these criteria. In recent years closer vetting of research proposals has brought most of the current projects truly into the collaborative category. Vigorous monitoring is needed to maintain this as the norm, otherwise the collaborative concept will be diluted and not make the best use of scarce resources both in the aid agencies and in the Centres.

One issue important to deal with early in a discussion of collaborative research is the view held by some that emphasis should be given to tripartite collaborative work involving the Centre, a Canadian institution and NARS or a university in a developing country. Some collaborative projects that are closer to basic than strategic research, or where very special equipment or unusual expertise is needed, do not lend themselves to the tripartite model and are best handled between the Centre and the Canadian institution. In other cases collaborative basic or strategic research between Canadian and developing country institutions may not benefit from the participation of the Centre. It is important not to generalize. Although there may be projects which lend themselves to tripartite arrangements, the complexity in arrangement of these should not be underestimated. For the next few years emphasis should be placed on strengthening and consolidating collaborative partnership between Canadian institutions and the Centres and between Canadian and developing country universities or NARS to assure a firmly established

collaborative record of excellence before attempting other than an experimental amount of tripartite activity.

Another issue that requires clarification is the strategy of IDRC in terms of the areas of collaborative research it is prepared to fund at the Centres. Should IDRC confine eligibility to some commodities or topics or should the list be open? IDRC prefers to concentrate its resources and this approach has been effective in general. This seems to be a reasonable strategy for the organization of the IDRC Cooperative Program as it might apply to collaborative work between Canadian institutions and developing country universities and national programs. The potential volume of collaboration in this sector is large and limits probably will need to be set using some criteria in addition to project quality. Grouping projects by IDRC topic priority would accomplish this.

There is merit in using an alternative approach for collaborative projects between the Centres and Canadian institutions. That is, leave the priorities more Centre-driven rather than superimposing an IDRC rigid topic limitation. This alternative is the more compatible of the two with the framework for collaboration with Centres set out in Section 5.1 of this paper. It would permit the Centres to more fully use the Canadian scientific community to meet their special needs. The IDRC strategy needs to be selected and made clear to the Canadian scientific community. Consequently it is -

Suggested that an IDRC strategy of clustering projects around a limited number of priority topics is appropriate for the Cooperative Program between Canadian institutions and developing country

universities or NARS, but a strategy of less rigorous clustering with the project portfolio more Centre-driven is more appropriate for the Centre-related component of the Cooperative Program.

Universities, Agriculture Canada and PBI are interested in more collaborative research with the Centres. If Canada wants to increase significantly the amount of collaboration, attention needs to be given to the major constraints which were identified in section 4.2.

1. Restriction on time available. Teaching loads at universities have increased substantially in recent years and it is clear that many faculty who would like to be involved and who are qualified to do so just do not have the time unless a release time arrangement is available. For many years the faculties of Agriculture and Veterinary Medicine have promoted the concept of CIDA-financed extra positions to permit release time of faculty for more international activities. CIDA has not been able to implement this over the years. The time has come to reassess this concept along with other possibilities in light of the drastically changed environment in which universities now operate, hence the suggestion in Section 5.1 to reevaluate the issue of how to increase or even maintain the current Canadian capacity for international activities.

One option is available immediately to cover a significant part of the problem specifically related to

collaborative research with the Centres. It is -

Suggested that in Cooperative Program projects with the Centres IDRC adopt a policy with flexibility to include in some agreements a salary component to provide the university with funds to release the scientist for enough time for the project.

The funds involved could be related to the costs of replacement rather than the actual payroll cost of the released faculty member in order to maintain project costs as low as possible. Under this policy the norm could be that most collaborative research would be funded without a release time component. However, for projects which the collaborating Centre is especially anxious to have the research undertaken by a specific individual and where the scientist can only do so with release time, the suggestion is that IDRC consider a release time element. It is recognized that a flexible policy is awkward to administer but the application of two conditions could provide a reasonable basis for an IDRC decision when release time is requested. The first is that the Centre would present its case to justify why it is important to have a collaborative research project with that scientist. The second is that the university scientist would have made a decision in advance that he/she did not have the time and although willing to undertake the research, decided not to accept the contract or grant unless release time costs were included. This arrangement calls for a firm and very difficult decision to be made by the university scientist on a research opportunity of real interest. It is at this point that IDRC could apply the judgment on whether or not the priority of the project justifies the inclusion of the

extra costs for release time.

Release time is an even greater issue for Agriculture Canada, PBI and presumably all other federally funded research units. They are willing to participate more in collaborative work needed by the Centres but the increasing budget problem of recent years has restricted and essentially removed their flexibility to contribute the scientist person years at no cost to collaborative projects.

Agriculture Canada can continue to collaborate with the Centres in the projects that fit their domestic mandate. In this case they can legitimately fund the salaries and part of the additional costs. There are clearly some strategic research areas of overlapping interest between the Centres and Agriculture Canada and PBI that could lead to collaborative projects in which the scientist person years of the Canadian researchers could be supplied by the Canadian research unit. To go beyond these limited areas for projects that fall outside of the domestic mandate is the problem because Agriculture Canada and PBI require the full direct costs of the research. This is an issue that requires discussion between IDRC and the federal research organizations.

ii. Information on research topics. A major constraint is the limited information Canadian scientists have on the topics for which Centres need research partners. Until action is taken on this it will not be possible to increase substantially the amount of collaboration. We cannot expect Canadian scientists to be current on all the research needs of all the Centres. Nor can we expect the Centres to be aware of all the expertise and interest that exists in Canadian

institutions.

The Centres provided lists of research topics for the meeting of European Donors in 1986 and provide lists to the Rockefeller Foundation in relation to their fellowship program in the social sciences for the Centres. From consultations with Centre Directors, it is reasonable to conclude that they would be willing provide such lists to Canada and that they would be very willing to do this if they could see programs in place in Canada to fund the collaboration. Therefore it is -

Suggested that the Centres be invited to provide a list of priority research or research-related topics for wide distribution at least annually to the Canadian science community using a communication list and system carefully designed to reach the appropriate scientists.

For the university sector the information should be communicated to faculties of agriculture, forestry, science, social science and others related to the work of the IDRCs and non-CGIAR centres.

- iii. Information on amount of funds available. Canadian scientists and administrators do not know how much money is available for collaborative projects from IDRC and consequently do not have a base for planning. They are informed annually of the approximate amount of funds available from the national granting councils but they do not have access to this information from IDRC nor do they have an historical base to draw upon. They need enough information to permit them to assess the opportunities.

This need could be met by distribution of the data from the last 2-3 years on Cooperative Project expenditures as classified by IDRC Divisions and category of developing country institutions, and by the number of awards and the success rate.

iv. Information on all collaborative opportunities.

Administrators and scientists from the universities and federal research establishments all say they need more information on collaborative opportunities. Students say the same.

v. Indirect cost component of Collaborative Research

Agreements. Indirect costs are not an issue in relation to collaborative visiting scientist, postdoctoral or thesis research programs. The issue of indirect cost levels in IDRC collaborative research agreements is a problem within Canadian universities. It is an irritant that interferes with the promotion of more IDRC-funded research and with the ease of administering such agreements. It needs to be resolved. Perhaps the procedure to resolve this would be discussions at national level between IDRC and IDO as was done to resolve the issue in CIDA arrangements with universities.

Although the discussion in this paper concentrates on research, it should be recognized that there are many other possibilities for cooperation in special training sessions, information handling, technology transfer, consultation on a range of topics and others.

5.7 Awareness and Promotion.

Raising the level of awareness of opportunities is clearly one of the most important steps that can be taken to increase interaction with the Centres. Once decisions have been made on the elements within the Canadian package for collaboration with the Centres an awareness and promotion program should be launched. The approach taken would be to fully inform the scientific community of the collaborative opportunities and support programs available and the procedures. Scientists will appreciate this and then will make their judgments on participation from an improved information base.

Special effort is needed for 2-3 years to raise the level of awareness of collaborative needs and opportunities. Then a continuing activity is required to keep the scientific community informed.

The following would help to accomplish this:

- i. A consolidated brochure. The information now available is diffuse with no sharp focus on the Centres. A brief ready-reference brochure would increase the visibility of the Centres and make it easy for administrators, scientists and students to be aware of all opportunities for collaborative work with Centres. It would include a short description of arrangements for visiting scientists, postdoctorals, thesis research, collaborative research and other opportunities for interaction; it would indicate that a list of collaborative research priorities would be available and where to find it; and it would list the contact points in the Centres, IDRC and CIDA for detailed information and other procedures.

- ii. List of collaborative research priorities as discussed earlier.
- iii. Consolidated leaflet on graduate thesis research at the Centres as discussed earlier.
- iv. A special meeting with Deans. When the above three are arranged a special meeting is suggested with Deans of Agriculture and Veterinary Medicine, IDRC, CIDA, Canadian members of Centre boards and some Centre Directors or delegates to discuss the new arrangements, information sources and procedures. Deans and Vice Presidents of Research also should be informed in a meeting which could be the annual meeting of the Canadian Association of University Research Administrators.
- v. Meetings at Universities. Early in the special 2-3 year period following the meeting with Deans, it would be helpful to encourage a meeting on campus at a number of universities to provide information directly to university and other scientists in the local area. Resources for this could be local scientists with experience with the Centres, Canadian members of Centre boards, IDRC and CIDA staff, and Centre representatives. Centre Directors with whom this possibility has been discussed indicated that they would be willing to participate or arrange for a deputy in an organized set of meetings especially if this was related to increased opportunities for collaborative activities.

Some organization needs to be identified to coordinate these arrangements and this could be IDO, IDRC or CNC. The

IDO which is concerned with the university sector might wish to participate but not be the focal point because the information is to serve not only the universities but federal and other research units. The logical organization is the CNC because its mandate is to encourage and facilitate the contribution of the Canadian scientific community to the advancement of agricultural research for the developing countries. Although CNC is an NRC committee, it has a strong connection with IDRC because the International office for CASAFA is located in IDRC. CNA at its recent meeting agreed it would take on this responsibility provided it had access to modest office support. It is -

Suggested that the CNC with office support from IDRC assume responsibility for developing an integrated plan to provide information to the Canadian science community on collaborative needs and opportunities with the Centres and include in it the following components and others as appropriate:

- i. A brief publication consolidating information on all collaborative opportunities.
- ii. An annual list of collaborative research topics supplied by the Centres.
- iii. Encouragement for and assistance in arranging information sessions at universities for scientists at the

university and in the region.

The awareness and promotion package must be a realistic one and geared to provide information and encourage participation within the confines of the financial resources available for the collaborative activities.

ANNEX 1. CANADIAN CONTRIBUTIONS DIRECTLY TO THE CORE BUDGET OF THE CGIAR
CENTRES (US MILLION)

	<u>CIDA</u>	<u>IDRC</u>	<u>Total Canada</u>	<u>Total Contributions From all Donors</u>
1972	1.16	0.18	1.34	20.75
1973	1.78	0.35	2.13	24.99
1974	4.70	0.65	5.35	34.60
1975	4.34	0.99	5.33	47.59
1976	5.39	1.78	7.17	62.92
1977	6.80	1.31	8.11	77.27
1978	7.37	1.05	8.42	85.09
1979	7.54	0.82	8.36	99.54
1980	6.88	1.53	8.41	119.63
1981	7.55	0.97	8.52	130.95
1982	8.29	1.06	9.35	143.81
1983	9.95	1.96	11.91	164.65
1984	10.02	1.02	11.04	173.41
1985	9.70	1.30	11.00	170.17
1986	10.64	1.27	11.91	191.42

Source: 1984 and 1985 CGIAR Annual Reports and CGIAR Secretariat estimate for 1986

ANNEX 2. COLLABORATIVE PROJECTS BETWEEN CANADIAN INSTITUTIONS AND IARC's,

APRIL 1987

	<u>Fund Source</u>	<u>Canadian Institution</u>
<u>CGIAR Centres</u>		
CIAT		
Genotyping: field beans, cassava, forage legumes	IDRC (AFNS)	University of Manitoba
CIMMYT		
Fusarium resistance	IDRC (AFNS)	Agriculture Canada
Weevil resistance	IDRC (AFNS)	University of Ottawa and Carlton
Data processing	IDRC (IS)	Agriculture Canada
CIP		
Evaluation of potato germplasm and nutritive value (CIP scientist at Fredericton)	CIP	Agriculture Canada, Fredericton
IBPGR		
Cryopreservation of clonal genetic resources	IBPGR	University of Saskatchewan
Cryopreservation of maize tissue and organ cultures	IBPGR	Western University
Collection and evaluation of cereals from Turkey	IBPGR	University of Saskatchewan
ICARDA		
Faba bean pollination	IDRC (AFNS)	University of Manitoba
Faba bean pathology	IDRC (AFNS)	University of Manitoba
Lentil haploids	IDRC (AFNS)	University of Manitoba
Lentil news and information service	IDRC (IS)	University of Saskatchewan
Rhizobial carrier systems	IDRC (AFNS)	University of Manitoba

Barley yellow dwarf virus (ICARDA and CIMMYT)	IDRC (AFNS)	Laval University
ILCA		
Trifolium rhizobium	IDRC (AFNS)	University of British Columbia
Forage legume agronomy	*	University of Manitoba
ILRAD		
Biochemical aspects of structure and function of parasite trypanosomes	ILRAD	University of Victoria (1 year visiting scientist)
Purification and characterization of variable surface glycoproteins of <u>trypanosoma vivax</u>	*	University of Western Ontario
Amino-acid sequence of purified surface proteins of <u>Trypanosoma vivax</u>	*	University of Victoria
IRRI		
Vortex wind machine	IDRC (AFNS)	University of Moncton
Editing and publication production	IDRC (COM)	University of Toronto Press
<u>Non-CGIAR Centres</u>		
AURDC		
Soybean rhizobia	*	Agriculture Canada, Alberta

* Information not available

ANNEX 3. CIDA SPECIAL PROJECTS AT THE IARCs and NON-CGIAR CENTRES IN 1986

	<u>Project Title</u>	<u>Country/Region</u>
<u>CGIAR Centres</u>		
CIAT	CIAT regional coordinator	SADCC
	East African bean program	Anglo-Africa Region
CIMMYT	East Africa cereal program	Anglo-Africa Region
	Grains development	Ghana
	Wheat project	Bangladesh
	CIMMYT II	Haiti
ICRISAT	Agricultural research: sorghum and millet	SADCC
IRRI	Bangladesh rice research and training	Bangladesh
	Rice research phase II	Burma
ISNAR	Guidelines for NARS strategies	SADCC
<u>Non-CGIAR centres</u>		
ICRAF	ICRAF Agroforestry network	SADCC

ANNEX 4. COLLABORATIVE IDRC (AFNS) PROJECTS¹ BETWEEN CANADIAN INSTITUTIONS
AND DEVELOPING COUNTRY INSTITUTIONS OTHER THAN IARCS

Chile	Dry beans	University of Guelph/Pontifica Universidad Catholica de Chile
China	Biological control	University of Guelph/Chinese Academy of Agricultural Sciences
Costa Rica	Tissue culture	University of Calgary/ Universidad de Costa Rica
	Leaf Spot	University of Alberta/ Universidad de Costa Rica
Egypt	Microbial control	Agriculture Canada/National Research Centre, Egypt
El Salvador	Native swine II	McGill University/Ministry of Agriculture
Guatemala	Bean utilization	University of Manitoba/INCAP
	Native swine II	McGill University/INCAP
Ivory Coast	Root crops	University of Montreal/Universite National de la Cote d'Ivoire
Malaysia	Buffaloes	University of Guelph/Universitie Pertanian Malaysia
Saint Lucia	Farming systems research	University of Guelph
CARDI	Farming systems research	University of Guelph
Several countries	Oilseed anther culture	Agriculture Canada

1. Agriculture and food projects excluding aquaculture, mariculture and forestry

ANNEX 5. ACRONYMS

AFNS	Agriculture, Food and Nutritional Sciences Division of IDRC
AUCC	Association of Universities and Colleges of Canada
CAD	Canadian dollars
CARDI	Caribbean Agricultural Research and Development Institute
CASAFA	International Commission on the Application of Science to Agriculture, Forestry and Aquaculture of the International Council of Scientific Unions
CGIAR	Consultative Group on International Agricultural Research
CIDA	Canadian International Development Agency
IARCs	International Agricultural Research Centres
IDRC	International Development Research Centre
INCAP	Institute of Nutrition of Central America and Panama
NARS	National Agricultural Research System
Non-CGIAR centres	International agricultural research institutions similar to the IARCs and loosely associated with them in the CGIAR System
NRC	National Research Council of Canada
NSERC	National Science and Engineering Research Council of Canada
PBI	Plant Biotechnology Institute of NRC
SADCC	South African Development Coordination Conference
TAC	Technical Advisory Committee to the CGIAR
<u>CGIAR Centres</u>	
CIAT	Centro Internacional de Agricultura Tropical
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo
CIP	Centro Internacional de la Papa
IBPGR	International Board for Plant Genetic Resources

ICARDA	International Center for Agricultural Research in the Dry Areas
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IFPRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
ILCA	International Livestock Center for Africa
ILRAD	International Laboratory for Research on Animal Diseases
IRRI	International Rice Research Institute
ISNAR	International Service for National Agricultural Research
WARDA	West Africa Rice Development Association

Non-CGIAR centres

AVROC	Asian Vegetable Research and Development Centre
IBSRAM	International Board for Soil Research and Management
ICIPE	International Center of Insect Physiology and Ecology
ICLARM	International Center for Living Aquatic Resource Management
ICRAF	International Council for Research in Agroforestry
IFDC	International Fertilizer Development Center
IIMI	International Irrigation Management Institute
INIBAP	International Network for the Improvement of Banana and Plantain

ANNEX 6. CATEGORIES OF RESEARCH

Basic research - that designed to generate new understanding (e.g. how the partitioning of assimilates is influenced by plant height)

Strategic research - that designed for the solution of specific research problems (e.g. a technique for detecting dwarfing genes in wheat seedlings)

Applied research - that designed to create new technology (e.g. breeding new varieties of dwarf wheat that can respond to high levels of nitrogen without lodging)

Adaptive research - that designed to adjust technology to the specific needs of a particular set of environmental conditions (e.g. incorporating dwarf wheats into farming systems of the rainfed areas of the Pamean Region of Argentina)

Source: Second Review of the CGIAR, Report of the Review Committee. p.40. November 1981.