CANADIAN SUPPORT TO AGRICULTURAL RESEARCH FOR THE DEVELOPING WORLD

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Introduction

On this 100th anniversary of Canada's research system, I am most grateful for this opportunity to celebrate another aspect of Canadian research support -- our funding of agricultural research in developing countries.

Though it is the Canadian International Development Agency (CIDA) that provides the lion's share of funding for international development, this audience is doubtless equally aware of the contribution of the International Development Research Centre (IDRC). Together, IDRC and CIDA manage Canada's contribution to the centres of the Consultative Group on International Agricultural Research.

Designing the best, most effective research support programs is every donor's goal. To that end, we meet here in Ottawa for important discussions about the future directions and strategies of the international centres. As important as is this support of CGIAR centres, I am going to dwell in this talk on how Canada's funding agencies -- and, in particular, IDRC -- contribute to the overall international agricultural research system in other ways.

By relating IDRC's strategy for the complex task of allocating agricultural research support, perhaps I can help set the stage for this week's discussions. You will see that the IDRC style of research support, though modest in comparison with that of some donors, is an interesting model for agricultural research in the future: focussed, cooperative, and practical ... interactive rather than interventionist.

Any discussion of agricultural research must take into consideration trends in food production and demand for the next decades, and this talk is no exception. We will also examine how the international food production research system evolved over the last 25 years. Finally, I will share with you examples of typical IDRC research support and suggest ways to further strengthen the international agricultural research community.

Food Production in Developing Countries

Though it is popular to assume that developing countries are inefficient food producers, food grain production in developing countries has steadily increased since the early sixties. For example, between 1960 and 1981, rice production increased 3 and 2.5 per cent annually in Southeast and South Asia respectively. Average annual growth rates between 1972 and 1977 ranged from

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2.7 to 5.8 per cent. In Burma, China, India, Indonesia, Philippines, South Korea and Thailand, this represented an average 1.2 per cent higher growth rate than for the previous five years (Swaminathan, 1982).

Such rapid increases in productivity are typical during the rapid expansion phase of agricultural development. They are the result of widespread introduction of high-yielding, disease- and pest-resistant varieties; improved fertilizer use; and better crop management.

These dramatic increases cannot be sustained, however. M.S. Swaminathan, director-general of the International Rice Research Institute (IRRI), states that in some areas of Asia, recent production increases may be reaching a plateau -- production increases in excess of 3 per cent per annum will be increasingly difficult to achieve.

The demand for food, however, is not limited, and is expected to increase at rates well above 3 per cent a year. This increased demand is due not only to increasing population, but to increasing affluence. Mellor reported in 1982 that more than 700 million people live in Third World countries that experienced per capita income growth rates in excess of 4 per cent between 1970 and 1977. It's reasonable to expect other highly populated countries to join this class. These newly affluent countries can expect food demand to grow at rates well over 5 per cent per year (Table 1), a rate that's almost impossible to match with increased production.

World food agriculture in the 1950s and 1960s was characterized by sizeable affluent populations generating food surpluses, and an enormous population of very low income earners with a slow growth in demand for food. In the next few decades, however, an increasing percentage of the world's population will increase its food demands, and only a small group will be affluent with low demands for food and high food production growth rates.

TABLE 1

THE INCREASING DEMAND FOR AGRICULTURAL COMMODITIES
Hypothetical Projections

Levels of Development	Rate of population Growth	Rate of Per Capita Income Growth	Income Elasticity of Demand	Rate of Growth in Demand
Very low income	2.5 %	0.5 %	1.0 %	3.0 %
Low income	3.0	1.0	0.9	3.9
Medium income	2.5	4.0	0.7	5.3
High income	2.0	4.0	0.5	4.0
Very high income	1.0	3.0	0.1	1.3

Source: Mellor, 1982

This shift of large portions of the world population from very low income/low demand growth to rapid income/high demand growth combined with the shortage of prime agricultural land will put a serious strain on the world's ability to provide sufficient food. To meet with the inevitable growth in demand, human populations will increasingly venture onto marginal land -- lands that are difficult to irrigate and which have other serious production limitations. Such encroachment on marginal lands does not bode well -- loss of land to erosion already seriously compromises future food production in many parts of the world. For marginal lands to be converted to efficient food production systems, substantial capital investment is required for land rehabilitation. Such changes also demand higher research investment to arrive at sustainable production systems.

THE INTERNATIONAL AGRICULTURAL RESEARCH STRUCTURE

We know that food production can be increased by expanding arable land area; increasing cropping intensity, crop yield and by-products use; and decreasing crop losses. Each pathway demands research in crop and animal production for a wide range of environmental and socio-political conditions. It is not sufficient to develop "improvements" in isolation from the end users. There are four groups contributing to such research: ministries of agriculture and universities in developing countries; international and regional research institutes; and universities and specialized research institutes (primarily in developed countries); and the donor agencies.

Research in developing countries. At present, most agricultural research is conducted by ministries of agriculture and universities in developing countries (Table 2). These are in the best position to develop improved technologies, taking into account local food demands, prevalent pests and diseases, land and weather conditions, and social and institutional factors.

TABLE 2

TOTAL AGRICULTURAL RESEARCH INVESTMENT FOR DEVELOPING COUNTRIES (1984)

	Total Budget ($ USD millions)	%
CGIAR	175	8.6
International Non-CG (including Regional)	77	3.8
National (Third World)	1,786	87.6
Total	2,038	100.0

Based on IDRC study of non-national research and P. Oram (1985)

Although public expenditures on agricultural research increased faster in developing countries than in developed countries during the last three decades, trained manpower, strong research institutions, and capable research management are often lacking. Less-developed countries still invest in agricultural research less than a third of the percentage of the value of agricultural production that developed countries invest.

In less-developed countries, scientists are often isolated from their peers and from important information sources. They are generally poorly paid and have little to spend on research operations.

International and regional agricultural research institutes are the next component. Most were established during the last two decades, and the 13 associated with the CGIAR have a total budget approaching 185 million U.S. dollars. Funding is provided by about 30 donor governments, international funding agencies, and foundations. The contributions of these centers to increased food production and food security are well-recognized (Anderson, 1985).

The international centers now deal with most of the major food crops and animals. While the CGIAR centers have hastened the development of new technologies, particularly in the major cereals, they have been less successful at providing an international research service to national programs. Fortunately, the CGIAR system is increasingly active in the conservation of genetic materials, widespread testing of advanced lines, coordination of research activities in different locations, the development of better research methods, and specialized training in research techniques. The CGIAR's ad hoc group on future strategies recognized this when it met in Bellagio in January, 1986. It called for "new and more effective mechanisms... for establishing close collaborative linkages ... to conduct joint research on problems of national priority and to assist national programs..." If applied, this strategy will lead to better collaboration between and among national program scientists -- perhaps in the form of networks, which facilitate collaboration with international centres to identify research priorities and methods.

To complement this new focus on national programs, donors are also working outside CGIAR to respond to additional research needs identified by developing countries. These initiatives emphasize international and regional collaboration through networking, and the nurturing of good research without the expense of creating major facilities.

Both these approaches -- networking and supporting existing national research facilities -- strengthen the ability of developing-country researchers to identify and solve their own problems. Examples of this approach are the International Council for Research in Agroforestry (ICRAF), the International Board for Soil Research and Management (IBSRAM), and the International Network for the Improvement of Banana and Plantain (INIBAP).

Universities and specialized research institutes, many of which are in developed countries. These organizations provide important "backstopping" to national programs and international centres. Canada, like some other donor countries, has helped its research institutions to participate in

developing-country research. IDRC's own Canadian Cooperative Program was established in 1980 to support collaborative research projects with academic, governmental, and private research groups in Canada on topics of interest to developing-country institutions.

The IDRC Cooperative Program has three objectives:

- To develop the scientific and technological research capacity of the participating Third World institutions or groups by facilitating their collaboration with the Canadian scientific community;

- To create channels of scientific communication to transfer successful Canadian research to Third World researchers (the even more difficult transfer -- from scientist to user -- can then be addressed in the context of the developing country involved, as a separate step); and

- To encourage Canadian research to take into consideration Third World concerns.

Funding agencies: This fourth component includes governmental and non-governmental organizations that provide bilateral and multilateral funding to national research programs. Approaches vary. Support for agricultural research in developing countries ranges from scientific imperialism to completely uncontrolled and unmonitored displays of goodwill.

It is becoming evident that bilateral aid is increasingly failing to meet Third World needs. A 1984 study claims that the percentage of aid based on donor interest of five major donor countries rose from 55 to 71 per cent over the last 10 years (Maizels and Nissanke, 1984). Nearly all of the 29 per cent that met recipient needs came through multilateral aid.

Even if this analysis is only partly accurate, it illustrates the imperative need to increase donor coordination, thereby helping bilateral aid to behave more like multilateral support. The CGIAR's unique coordinating structure permits it to respond to the needs of developing countries without being overly affected by contstraints imposed by donor agencies. In this respect, the creation of the Special Program for African Agricultural Research (SPAAR) is a very timely initiative.

Though international support for food production research is certainly well intended, it sometimes fails to give assistance to Third-World researchers. The opportunity for them to participate is still less than adequate. Too often, donor-sponsored research is conducted by well-paid expatriates who operate in a cocoon that allows them to make impressive achievements. Seldom are these scientists required to cope with the discouraging constraints placed on national program researchers with whom they are frequently compared. Even the strength of international research centres at times undermines national programs by competing with them or creating unhealthy dependencies, thus preventing these programs from responding to national needs.

Canada's Support

Canadian support is provided by CIDA and IDRC. CIDA, the Canadian International Development Agency, is Canada's official development assistance

agency. Its provides core support to CGIAR (totalling 91.5 million US dollars between 1972 and 1986), and also supports national programs directly with bilateral funding. The typical CIDA bilateral research funding is directed to large projects with substantial institution- building focus, and include funds for infrastructure and training. Many of these projects employ teams of Canadian scientists contracted by Canadian universities or consulting firms.

TABLE 3

CIDA Support to Agricultural Research and Technical Assistance from 1971 to 1984 (in million $ CAD)

	Latin America	Africa	Asia	Total
Agriculture	23.0	112.5	44.5	180.0
Fisheries	2.0	1.5	0	3.5
Forestry	0	0.3	5.0	5.3
Total	25.0	114.3	49.5	190.0
Number of projects	49	50	18	117

IDRC supported projects differ from CIDA projects in that they concentrate on research projects developed by Third World institutions to find their own solutions to problems. Its unique mandate differs from that of most other funding agencies, and was spelled out in a special act of the Parliament of Canada in 1970.

IDRC's Agriculture Division is devoted to encouraging and supporting applied research for the benefit of rural peoples in Asia, Africa, the Middle East and the Caribbean and Latin America. Its projects embrace all aspects of agriculture -- from crop and animal production, to fisheries and forestry, to post-production technology and agricultural economics. It is just as likely to be supporting a project to develop better small-animal husbandry as one to design and test an inexpensive dehuller. The key in many of these cases is that the research is not only conducted on the research station -- frequently the farmers and fishermen whom the research will ultimately benefit are colleagues and consultants to the process.

During its first 15 years of operation, the Division's support totalled $178 million CAD for 719 projects. The IDRC's Social Sciences Division provided additional support for work on social, economic, and policy-related agricultural issues. Together with our Information Sciences, Fellowships and Awards and Health Sciences Divisions, this put another $ 13 million into the kitty over the same period.

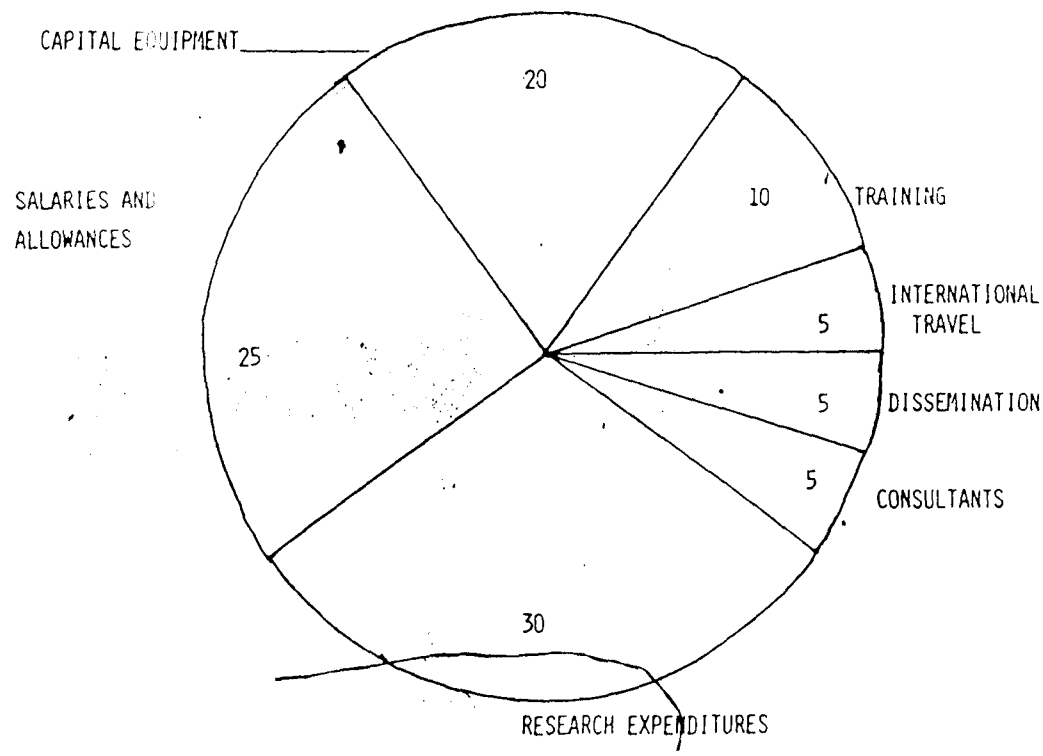
The vast majority -- about 72 per cent -- of IDRC funding supports projects at national research institutions in developing countries. CGIAR centres received 13 per cent, regional research institutions 8 per cent and international centres not associated with the CGIAR, 3 per cent. About 18 per

cent of IDRC agricultural funding is spent through the Cooperative programs on projects to which Canadian institutions make inputs.

How are IDRC supported projects run? Most are conceived, planned, and executed by Third World scientists. As can be seen here, projects usually include funding for equipment, supplies and materials, operational costs, and funding for training activities and consultants (Fig. 1). They are usually co-sponsored by the recipient institution's research program. IDRC provides expert advice in research design and techniques if requested but, more and more, project recipients consult their colleagues in other developing countries by way of research networking. IDRC program officers monitor the projects and, as fellow scientists with considerable research experience, they can often be of assistance. IDRC funds projects in phases of one to four years. Commodity research projects typically pass through three or four phases for about ten years of support.

Figure 1.

TYPICAL COMPOSITION OF IDRC SUPPORT TO A RESEARCH PROJECT (%)



IDRC agricultural research support seeks to complement other existing national and international efforts. To begin with, its food and agricultural research stayed narrowly focussed to ensure that it responded to the most urgent needs, avoided duplication, developed its own expertise, and encouraged evaluation of existing research approaches used by Third World scientists (IDRC, 1981).

During the beginning years, attention was paid to developing criteria for support. For example, crop and animal production systems (CAPS) projects should meet these requirements for support:

- production systems of the semi-arid tropics;
- indigenous crop and animal species;
- small-holder production systems research;
- research activities in national programs which relate to the work of international centres; and
- on-farm and farmer-participant research.

In keeping with its commitment to complementarity, IDRC's research funding balances CGIAR's (Table 4) by putting more emphasis on research support for oil crops, plantains and banana, grain legumes and ruminant production. This commodity-based table hides the Centre's increasing commitment to production systems research (Table 5).

The Importance of Production Systems Research. It is our experience that the main constraint to increasing farm productivity through technological change rests with the complex task of incorporating improved varieties and management techniques into farmers' crop and livestock production systems. This constraint is most strongly felt in the national research systems, particularly those in low-income countries. It is the national programs who have to face the final test for technology recommendations : farmers' acceptance. This is why support for production systems research now accounts for a third of the IDRC funds allocated to crop and livestock research.

TABLE 4

PERCENTAGE ALLOCATION BY COMMODITY

	CGIAR 1983[1]	IDRC/CAPS - 1985[2]
CEREALS	51	13
ROOTS & TUBERS	13	12
GRAIN LEGUMES[2]	15	23
OIL CROPS [2]	1	9
"STARCHY" BANANAS	1	4
RUMINANT PRODUCTION	13	26
RUMINANT DISEASE	6	1
OTHER	--	12

1 Production systems allocated to main commodity
2 Assuming half of groundnut and a third of soybean production as oil crops.

IDRC has supported several networks on cropping, livestock and farming systems research, most of these in close collaboration with international or regional centers. National programs have greatly increased on-farm testing of technological components and have at times established full fledged farming systems research programs. In several countries, important institutional modifications have been made to accommodate farming systems applied research (FSAR). These programs deal with a range of crops and livestock types, because small holders rarely depend on a single commodity.

TABLE 5

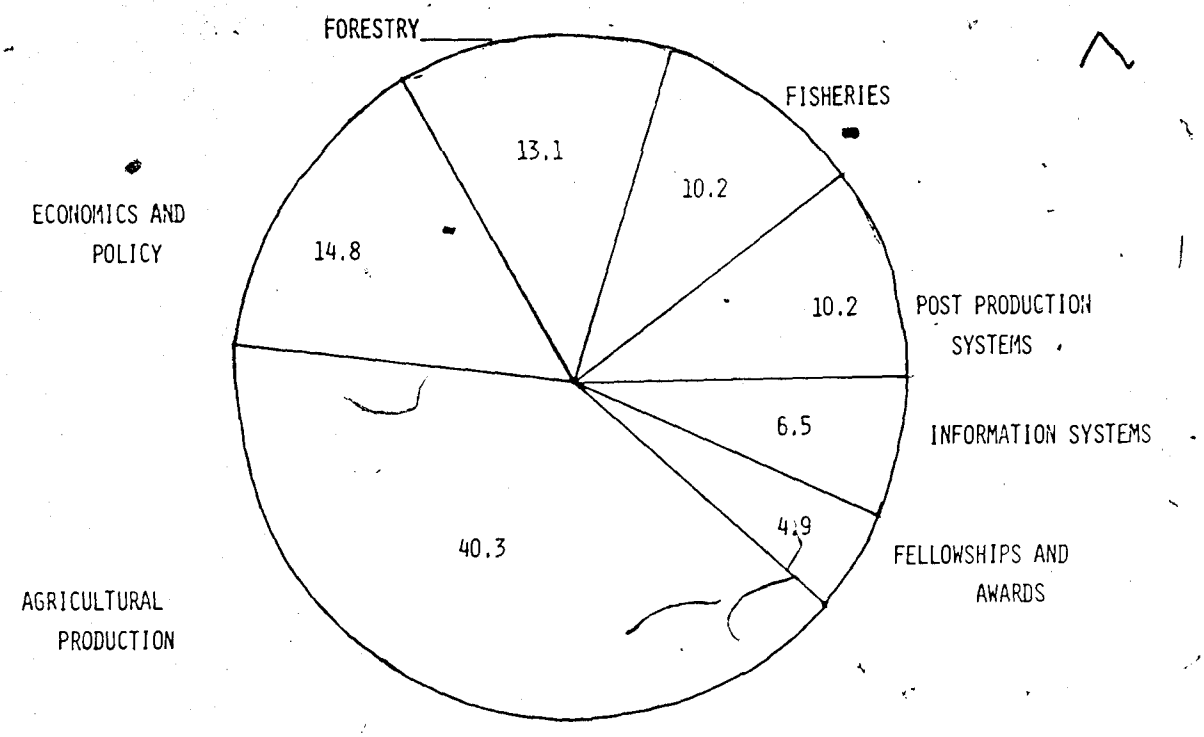
COMPARISON OF
SUPPORT TO CROP AND LIVESTOCK RESEARCH
BETWEEN 1979 AND 1985

1979 TOTAL BUDGET * (100,000 CAD)	%	ACTIVITY	1985 TOTAL BUDGET * (100,000 CAD)	%
54	20	CEREALS	32	7
39	14	GRAIN LEGUMES	88	19
10	4	OIL CROPS	30	7
37	13	ROOT CROPS	35	8
2	1	PERENNIAL CROPS	18	4
24	9	PASTURE AND FORAGES	22	5
15	5	ANIMAL NUTRITION	16	4
57	21	CROPPING SYSTEMS	58	13
8	3	ANIMAL PRODUCTION SYSTEMS	54	12
6	2	FARMING SYSTEMS	56	12
21	8	OTHER	43	9
273	100	TOTAL	452	100

*ACTIVE PROJECTS

Figure 2.

IDRC 1986/87 BUDGETED ALLOCATIONS TO AGRICULTURE
(EXCLUDING MANAGEMENT COSTS) (%)



International centers have given training and supported research design, monitoring and information sharing for researchers from national programs. This has unfortunately led several IARCs to approach national programs independently with different formulations of FSAR, and with widely differing beliefs about the role and institutional place of FSAR. Particularly in Africa, where many CG centers actively support national programs, this lack of agreement about the research approach and objectives "tend to strongly suggest a state of confusion in Farming Systems Research" (Chigaru and Avila, 1986).

National programs appear to be helped most by FSAR support accommodating all farm enterprises, and dealing with environments small enough to ensure a good fit of technology, but general enough to be manageable for research and extension services. In this regard, IARCs could coordinate their activities on a regional basis, and assist in identifying the most appropriate way to introduce FSAR into national programs. In this way, they could provide regional support for training, methodology development and exchange of information and genetic materials.

To illustrate the IDRC approach to developing-country agricultural research support, I am going to "walk" you through three quite different research approaches: funding of national and regional researchers (in this case, dedicated to expanding Asian fisheries research); and several models for the development of research networks, using the example of the oilseeds and bamboo and rattan networks.

Fisheries Research in Asia. Many of IDRC's 30 aquaculture projects in Asia give priority to species that feed low on the food chain -- carp, tilapia and some native cyprinids like Leptobarbus, Probarbus, and Puntius sp. -- for fresh-water culture; and milkfish (Chanos chanos), mullet, oysters and mussels for salt- and brackish-water culture. Polyculture systems used in Chinese or Indian carp culture are often emphasized. We also support research to integrate aquaculture with various crop and livestock enterprises on the farm. Asian aquaculture research has proliferated rapidly in the last 10 years, and IDRC supports work on fish diseases, fish pests, pond management, artificial spawning, fish genetics, fish nutrition, fisheries economics and fish handling and processing, with a variety of national and regional institutions.

Frequently, IDRC projects include several research divisions. The fisheries economics network coordinated by the International Centre for Living Aquatic Resources (ICLARM) is supported by IDRC's Social Sciences and Agriculture divisions. The Information Sciences division supports information and documentations projects at three institutions. The Cooperative Program spoken of earlier has funded collaborative projects on such up-stream research as fish genetics, breeding techniques based on luteinizing hormone-releasing hormone (LH-RH) and sperm preservation. 1985 spawning season tests, using a synthetic LH-RH analogue administered as an injection or implant, resulted in 80% spawning success, while sham treated fish regressed.

Support for work on breeding techniques proved important to the milkfish research program at SEAFDEC -- the Southeast Asian Fisheries Development Center -- which IDRC has supported for 10 years. Milkfish is the predominant aquaculture species in Southeast Asia. IDRC-supported research has worked towards improved fishery production, feeding/fertilization practices, disease control, and the socio-economic aspects of aquaculture production. SEAFDEC's efforts to encourage milkfish to breed in captivity have been highly successful. As a result, the Philippine government developed a national breeding program and is now testing the SEAFDEC technology for milkfish fry production on a pilot scale in 13 ecological zones.

Several other donors provide support for fisheries research in the Asian region: Japan; US-AID; ADB; CIDA; and FAO/UNDP, which funds the Network of Aquaculture Centres in Asia (NACA). FAO/UNDP, under NACA, also provides support for a Master of Aquaculture degree at SEAFDEC in association with the University of the Visayas. IDRC supports short courses in Fisheries Economics at the Universiti Pertanian Malaysia in collaboration with ICLARM.

Despite the excellent collaboration evident among scientists of these national, academic, regional and international organizations, full coordination of fisheries research in Asia has been difficult to achieve.

It is, therefore, timely that the recent TAC review of CGIAR priorities and future strategies recommend that the CG system give serious consideration to a new activity in aquaculture. Because of the obvious value of coordination to increasingly effective research networks, IDRC is very supportive of this proposed initiative. Because this is an excellent opportunity to build on the existing research in national, regional, and international institutions, the development of an organization patterned after IBSRAM, ICRAF, or INIBAP appears to have much merit.

Networks

IDRC program officers normally visit their projects twice a year. From the start, they discovered scientists working on similar problems who would benefit greatly from discussions with their peers. This led to small workshops as a means to assist scientists and IDRC staff in identifying research needs, making available outside expertise, and developing methodologies. By providing an effective channel for information and documentation services and specialized training, these groups of scientists became an important element for coordinating research efforts and donor support. Although some early IDRC-supported networks were global in coverage and managed by IDRC staff (Nestel and Cock, 1976), we soon realized the advantages of regional networks managed by a participating institution (IDRC, 1980).

As stressed by Plucknett and Smith (1984), networks should not become the instrument of an international center or donor organization. To be useful, they should respond to the needs of participating research institutions and give participants a role in the guidance of the network.

An excellent example is PRACIPA (Andean Cooperative Potato Research Program) and its four sister networks. These all follow the CIP (International Potato Center) model. They seek to apply their combined expertise to solving potato production problems. To that end, the networks sponsor research and training activities, taking into account the relative strengths and weaknesses of participating institutions. The networks have a steering committee responsible for designing and developing budgets for participating organizations' research projects. All networks have a coordinator, generally placed in a national program, who ensures that CIP can provide effective support in the form of germplasm, specialized training and the development of research techniques.

Other international centres have employed similar approaches for pasture research (for example PANESA - ILCA; tropical pastures - CIAT; farming systems - IRRI; beans - CIAT; and others. All have a steering committee to help with program definition and project monitoring.

The Oilseeds Network shows the cooperative influence of this concept. It deals with eight different oilseeds in 11 IDRC-supported projects in Eastern and Southern Africa and India. It may be of interest as an example of a network that has no direct link with an IARC. The network coordinator is based at the Institute of Agricultural Research in Ethiopia, where he can interact with the national program scientists, assist them when possible, and draw on their support for other projects in the network. With the help of the IDRC oilseeds information service, based on the library of the Ethiopian National Research Program, the coordinator provides photocopies of relevant information to all interested scientists. Computer printouts of references and abstracts of the various oilseeds works are also provided by IDRC's library to any scientists upon request. The coordinator also produces an annual oilseeds newsletter, which goes to all participating scientists and other interested researchers.

The network holds an annual workshop, which rotates around the various national research programs (the last one was held recently in Hyderabad). When requested, a consultant with specialized knowledge of a

particular crop is made available. Training courses of varying length at appropriate institutions are built into each of the projects.

Since certain national programs are concentrating their research on particular oilseeds, the network plans its activities so that national programs complement each other. Supporting research by institutions in industrialized countries is being planned. A project on dihaploidy in sesame, safflower and niger has been developed with Agriculture Canada.

The network participants in India, Egypt and Sri Lanka have developed several promising sesame varieties, some of which are in advanced multi-location testing. More recently, work on safflower in Egypt and India has stressed the development of smooth types and resistance to aphids, leaf spot and powdery mildew. The Indian projects in Patnagar and Hissar have identified a short-duration Toria rapeseed that can be grown without delaying the planting of wheat. In Ethiopia, the local selection Dodolla-1 and two Canadian varieties have been released.

Niger (Guizolia abyssinica) is grown as a subsistence crop in the highlands of Ethiopia on poorly drained soils. Over 2000 collections were evaluated, resulting in the identification of 450 germplasm lines, of which the best eight are now being tested.

Asian Bamboo/Rattan Network: IDRC supports 12 projects in Asia on bamboo and rattan. In the last 10 years, bamboo and rattan have emerged rapidly as the most important non-timber species in rural Asia. They are economically important as the basic raw material for many cottage-based as well as for many large-scale national pulp, paper, rayon and furniture-making factories. Both commodities provide significantly to the daily livelihood of hundreds of thousands of rural Asians in India, Sri Lanka, Indonesia, Thailand, Philippines, China and Malaysia, who are employed in growing, harvesting and manufacturing. An unconfirmed report puts the value of the rattan trade at about USD 1.5 billion and that of bamboo even higher.

Until about 10 years ago, interest in rattan and bamboo research was almost non-existent, except in India and perhaps China. In 1979 and 1980, Asian scientists recognized the potential of these two plants to diversify the utilization of South and Southeast Asian forest resources and to contribute a major source of regular income for the rural people (IDRC, 1980). Urgent research input was needed if a rattan/bamboo raw material crisis was to be averted in the eighties and nineties.

The scientists agreed on the major problems facing the crops and proposed research on: taxonomy studies and inventories; in situ conservation; seed technology studies on collection, storage and germination; propagation studies including tissue culture methods; silvicultural and management methods; growth-enhancement studies of growth regulators and fertilizers; appropriate harvest and post-harvest technologies including studies of mechanical and nutritional properties.

As a result of the above initiatives, IDRC has provided support for research on these two crops since 1979. Today, directly and indirectly, over 30 scientists are conducting 28 studies on rattan in five Asian countries and about another 20 scientists are working on 15 studies with Bamboo. The

studies cover all of the areas identified above. Rattan living gardens have been established in Thailand, Indonesia, Philippines, China and Sri Lanka; bamboo gardens have been created in China, Thailand and Bangladesh. Taxonomic studies on both crops are being conducted in most of the countries. Silvicultural studies are receiving support in all of the countries except Malaysia, India and Nepal. Seed and propagation studies are underway in the countries mentioned above, as are product utilization and economic studies.

IDRC's forestry program has promoted cooperation between the various recipients of its grants in developing countries through the organization of meetings both at national and regional levels, facilitated staff exchanges, training and, occasionally, consultancies. The Information Sciences Division helped in creating a Rattan Information Centre in Malaysia that collects and disseminates information on all aspects of rattan forestry and trade. They are in the process of supporting a similar activities for bamboo. To further enhance this flow of information, materials and technologies, the Centre recently appointed a part-time coordinator. His main function is to strengthen network activities in collaboration with a working group of representatives of participating organizations.

Over the last ten years, IDRC has supported a wide range of collaborative research networks. The following list gives a summary of the characteristics a network should ideally have:

- A clear problem focus.
- Response to a priority of national research systems.
- A regional, rather than global, scope.
- An effective advisory or steering group
- Effective coordination to organize meetings; provide operational support (travel and communications); organize training; and provide information and documentation support.
- Allowance for free exchange of germplasm and information.
- Linkages to upstream research and expertise.
- Ability to attract funding for participants' research activities.

These characteristics are not easy to achieve. The organization of steering committees is often fraught with problems of dominance by administrators and by political issues. The selection of the host organization for the coordination unit has proven difficult because of fears of international center dominance or lack of institutional capacity of national organizations. We have had to deal with several instances of rejection of international centers by a network steering committee. Where no mandated international center exists for the network's problem focus, linkages to upstream research are difficult to structure and maintain. Limitations to free exchange of germplasm have also reduced the effectiveness of certain networks. In other instances, lack of support for publication and information services has limited the contribution of networks.

Despite these drawbacks, research networks have been an effective, agile and participatory way of addressing food production problems. Our experience shows that coordinated high-quality research can be conducted in a national program setting. In addition, the chosen research methodologies are very likely adapted to limitations of developing countries and research results are

readily accepted by the national research and extension systems. Many of the drawbacks I listed can be avoided with stronger financial support. It is, therefore, most encouraging to see several donors supporting a network, as has been the case with IFAD and IDRC in IRRI's cropping systems work, and USAID and IDRC in ILCA's PANESA network.

CONCLUSION

Everyone in this room knows that food production problems know no boundaries -- cassava mealybug, rice turgo virus and black sigatoka of plantain march across borders without asking permission, playing havoc with farmers' incomes and city dwellers' food bills. That's why the research contributions of the international centers ae so important. But solutions don't end with centralized research facilities. Though many countries share common problems, the impact is felt differntly in each country. Production solutions must be tailored to each region's needs. They must be tested on-site, taking into consideration local traditions, farming methods and access to technology and other inputs.

I have shown you today how food production research depends on a diverse cast of players: the international agricultural research centers with their stable source of donor support are in the best position to coordinate the exchange of genetic materials, research methods and research results; the national research programs in developing countries are essential to identify the local problems and granting solutions validity in the local context; the regional institutes and research networks provide the glue to bring researchers together to share their woes and wisdom; and, finally, the farmers and fishermen and extension workers who bring to reality the work of all the rest of the cast.

The success of the CGIAR centers in providing the world's food system with increased resilience to face sudden setbacks is exemplified by the speed with which Asian and Latin American farmers now switch their seeds and methods to take advantage of new research.

Unfortunately, only countries with strong research systems can capture these benefits. The majority of Third World countries don't even have sufficient funding for field and laboratory work. Worse, they do not have access to current scientific information or the farm community. Their scientists have, by and large, been by-passed by the international research system.

It is essential for the international research community, including CGIAR, to enlist these researchers in the search for food production solutions. National programs should be ecouraged to conduct the lion's share of research required for commodity improvements, and to make better connections with the farm community to develop a farming systems applied research capability.

The important role of networks in achieving research synergy has been emphasized today bcause networks offer donors an ideal opportunity to supplement national program funding in a coordinated way. Such collaborative research networks stress the international nature of agricultural research and greatly increase the effectiveness of scarce funds.

Because funding is limited, IARCs will have to reallocate some research resources to network support and training. Staff may be relocated to take into consideration the regional nature of networks. This fits well with the ad hoc CGIAR group on future strategies' suggestion that CGIAR develop a more regional focus to respond to national program needs. In the case of farming systems research, such reorientation should include rationalizing the various methodologies, and working with existing networks.

The network approach has already strengthened a range of commodities and cropping systems. Now, it is urgently needed to address soil erosion, sustainability of production, increased production in high-rainfall environments, farming systems research, and research management. Several networks may require development by institutions outside the CGIAR, and I feel that a broadening of Canadian support for such institutions is most desireable. IDRC moved in this direction several years ago.

Canada already provides substantial support to national and international research in the Third World. Agriculture Canada, our centennarian host for today, stands, with Canadian universities, poised to make greater contributions of strategic or upstream research to international research networks within and outside the CGIAR. I hope that an increased proportion of Canadian development research funding can be channelled towards establishing and supporting collaborative research networks in cooperation with a consortium of donors. In IDRC's experience, this type of support, particularly when associated with a strong regional or international center, is a most effective way of strengthening national research capabilities.

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