

NATURAL PRODUCTS PROJECT

Best Practice for Innovation: Focus on IDRC Program Mechanisms

DRAFT REPORT

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November 20, 1998

Subject to Change Following the Workshop on November 25, 1998

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Best Practice for Innovation in Natural Products in Latin America and the Caribbean

Focus on IDRC Program Mechanisms

Introduction

For many years IDRC has been instrumental in supporting international research to find solutions to the developing world's social, economic and environmental problems. IDRC has a well established and highly regarded reputation for financing the adaptation of technologies to meet local social and environmental conditions. The development of research capacity in emerging nations has been IDRC's focus with special emphasis on "learning by doing". However, today's research environment has changed and granting agencies must keep in step with the changes. Reduced human and financial resources, increased demand and competing interests are influencing the research agenda and management systems for granting agencies throughout the world. An increasing demand

for commercial application of research results and linkages to the private sector are also influencing the way the business of research is carried out.

This report attempts to articulate ways and means for IDRC to select, support and administer those natural products projects where research results are intended to be integrated into local commerce, provide an economic dividend or be carried on beyond the end of the IDRC financing window. The report is not intended to provide recommendations for managing traditional development research programs nor for those with a purely policy research focus. The report suggests adding new selection criteria to existing systems, modifying the project development procedure and placing more emphasis on project management. It is hoped that implementation of the recommendations of this report will facilitate the generation of sustained benefits to the development clients, Canadian partners and IDRC.

The Context for Research in Canada

The Canadian government has a long tradition of providing financial support for research in an effort to gain new knowledge, provide answers to problems facing our society and generate both jobs and sustained economic growth. Programs have been available for both basic and applied research with a focus on financial support for work carried out in universities as well as small and medium sized enterprises. In this same vane, federal research funding has been available for developing nations and for foreign economies in transition mainly through the IDRC and CIDA.

Federal research funds intended for domestic applications have come under increasing pressure as budgets are reduced and programs are discontinued. The operations of every federal agency, with a mandate to carry out research, has been affected. Internal research teams have been downsized and extramural programs carved to the bone. The same is true of granting agencies for Canadian university research including MRC, NSERC and SSHRC. The cuts and severe impact have not been limited to domestic research efforts. The IDRC and CIDA have had their research and international development budgets reduced, see Table 1 on page 2, as well as a lowering of the human resource pool and administration budgets in each agency.

Table 1: Federal Expenditures on Research Programs (in millions of dollars)

	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98
IDRC	82	89	78	73	71	71
CIDA	69	61	62	51	54	50

Figures provided by Statistics Canada 1998

This situation has placed a great burden on all agencies to focus their remaining research resources on core mandates, to minimize duplication and to maximize efficiency. IDRC has responded to this challenge by reducing overhead costs, stabilizing program expenditures and generating new revenue from resource-expansion income through the management and administration of funds on behalf of other donor's.

The federal government has embraced the concept of partnership in order to leverage their investments and ensure maximum impact from the remaining allocations. The federal report from the Science and Technology Review, released in March 1996, noted the overriding need for clear spending priorities in light of the continuing pressure to reduce fiscal debt. The report underlined the need for public spending to focus on core activities in S&T and to find more efficient and effective ways to deliver those activities. The principle means identified for improving on the

efficiency of delivery mechanisms was the increased use of partnership arrangements between government departments and agencies and other key components of the innovation system. Annex 1 provides more information on partnership considerations.

Industry, too, has faced similar budgetary pressures over the past few years resulting in significant decreases in basic research investment as well as a sharp rise in mergers, acquisitions and alliance formation. Applied research continues to receive the lion's share of private sector investment. Funding pressures have streamlined the research process, focussed efforts on main business lines and eliminated many projects which were tangential to the core operations of each company. Management systems have had to be redesigned to increase the commercial impact of the research efforts, integrating new forms of planning, execution and evaluation into the process.

Canada's leading technology companies owe much of their success to government's investment in research, often at the university level. The university system supplies a pool of trained scientists and engineers. University research is also the source of a considerable amount of pre-competitive intellectual property that firms use as the basis for new products and services, as well as to support existing business priorities. Universities are also a supplier of research infrastructure and expertise for Canadian industry.

Canada's ability to undertake fundamental research and to train world-class research personnel is severely challenged at present. This is largely due to three major influences:

- The significant underfunding of basic research
- limited ability of industry to finance basic research
- a university culture that is resistant to change

Many provincial governments have significantly reduced university funding in recent years, impacting significantly on research (e.g. infrastructure, number of faculty, support of graduate students). Juxtaposition of this action by Provincial governments were the unprecedented cuts to Federal research Granting Councils budgets from 1994-97. Even with the restoration of Federal Granting Council allocations to 1994 levels, Canada is uncompetitive internationally in the research domain. These factors have also reduced our ability to fill human resource needs nationally in a number of key business sectors.

Only a small percentage of Canadian firms carry out R&D. Although private sector spending on R&D is growing at a steady pace, it is not enough to offset inadequate public sector spending. Competitive pressures dictate that industry spends the majority of its available research funds on projects that are closely linked to lines of business. Its ability to significantly increase spending on university research, particularly fundamental research, is inherently limited. In all developed countries, as in Canada, support for basic research, and in particular research training, is acknowledged to be primarily the role of the public sector.

Universities in Canada are undergoing a transformation to face the realities of limited resources and international competition for funding, students and staff. However, the university culture, including its reward system, is steeped in tradition and is resistant to change.

For Canadian firms and universities to successfully compete with other nations, we must keep pace with the most innovative centres in the world. This will require renewed investment in research and infrastructure by both the public and private sectors as well as accelerated change within the business, research and academic cultures. While Canada grapples with mechanisms to support basic and applied research in this country, we are also faced with the need to support developmental research in emerging nations.

Utility of Research

"Government funded basic research is a critical source of investment for developing a society's learning capabilities. Government funding expands the technological opportunities available for firms to draw upon as they go about developing new products and processes. It supports the training

of students, who upon entering industry, transfer their skills and knowledge about science and technology into the private sector. “ *The Socio-Economic Importance of Scientific Research in Canada*, PAGSE, 1997

Key contributions that publicly funded research can make toward economic growth include:

Increasing the stock of available knowledge

Forming networks and social interaction

Increasing the capacity for scientific and technological problem solving

Training skilled graduates

Creating new scientific methodologies and instrumentation

Supporting existing companies and creating new ones

IDRC’s research funding in the area of natural products has tended to focus on the first four areas and has been particularly successful in generating results in the first two. However, the last category “supporting existing companies and creating new ones” appears to increasingly be an area of interest for IDRC. This new focus on research of potential economic value may begin to shift proposal development and project management into areas where existing personnel have little expertise and departmental policies are not yet well considered. It will begin to shift the balance away from basic and policy research with a long-term focus towards more commercially relevant research with a shorter time horizon. As is the case for many Canadian research organizations which have moved along this path, such changes within IDRC could create cultural, personnel, training and departmental policy challenges. At the same time, this shift has the potential for making the Canadian research contribution more economically relevant to the developing nation clients, thereby ensuring a higher adoption rate and increased levels of local investment.

Setting Priorities for Developmental Research

The six development themes adopted by IDRC continue to address the most difficult social, economic and environmental issues facing developing nations today. These include: Food security, Equity in natural resource use, Biodiversity conservation, Strategies and policies for healthy societies, Sustainable employment and Information and communication. Projects involving the development of natural products have implications in each of these themes. In fact, many natural product projects could easily be considered as falling within more than one theme as its primary focus.

IDRC is not alone in selecting some of these themes for project delivery. Numerous development agencies and financial institutions around the world support similar activities in these areas. A variety of areas of focus, as they relate to natural products, used by these agencies (including IDRC) have been subdivided as follows:

Food Security: sustainable use of food resources; production, collection, refinement, storage and transportation; ecosystem management; variety improvement or adaptation; pest and disease control.

Equity in Natural Resource Use: sustainable resource management; production, collection, refinement, storage and transportation; water, soil and ecosystem management; by product utilization; pest and disease control; decision making processes.

Biodiversity Conservation: Risk assessment and risk management; indigenous knowledge of species utility; sustainable use; intellectual property protection; terrestrial and aquatic conservation schemes; regulatory capacity building; access to genetic resources.

Strategies and Policies for Healthy Societies: Disease prevention and treatment; policy making process; indigenous knowledge of species utility; intellectual property protection.

The categorization of research is not a simple task but is undertaken to clarify project selection, funding envelopes and project management. Natural Products research addresses many of IDRC's core themes and sub-themes, increasing the probability of IDRC interest and involvement. However, the increasing demand for such projects and the lack of other Canadian funding instruments for this type of work, will place greater dependency on the project prioritization and selection system. This system should be carefully reviewed to ensure that it will continue to meet the changing needs of both IDRC and its client groups.

Basis of Financial Support Changing for Developmental Research

IDRC has been tremendously successful in supporting research in the developing world to identify potential solutions to social, economic and environmental problems. The results of some of these projects have been incorporated into local practice or commerce however, many have been discontinued once the IDRC grant expired. In order to increase the utility of research results and their incorporation into the economic culture of the developing nation, IDRC must consider new ways of identifying, developing, selecting, monitoring and evaluating projects. In particular, the millions of dollars being invested by IDRC in projects related to natural products for medicine, feed and food hold great potential for generating economic as well as social benefits if the project results become integrated into local commerce. In order to accomplish a higher success rate for such projects, new ways of doing business will have to be found, to accommodate some of today's commercial and economic realities.

This new business model could include increased sharing of experiences among federal Program Managers, division of projects into a developmental research and commercial application phases, adoption of additional project selection criteria, and revised approaches to project monitoring and evaluation.

Opportunities for Federal Inter-Program Fertilization

Federal Program managers have an opportunity to share experiences among themselves thereby increasing their experience base and drawing on the experience of others. Due to the diversity of federally funded activities among the full range of research and regional development programs, managers have an opportunity to learn from their counterparts and draw experience from a variety of program strengths and weaknesses, selection criteria and evaluation mechanisms, successes and failures. Sharing experiences in this way could help to build stronger programs and facilitate increased success rates for both IDRC and other federal agencies. For example, NRC's Industrial Research Assistance Program could be an excellent source for selection criteria for projects involving small companies. The following evidence shows the commercial impact that IRAP has had in the life sciences sector by supporting early stage research with an entrepreneurial flavour.

1. Of University 530 Spin off firms found to date, IRAP has been involved in the early stages in half of them. IRAP assisted 41 of 82 Biotech firms and 58 of 108 medical firms.
2. In Life sciences (human) there are 80 + firms listed on various Stock Exchanges in Canada (and NASDAQ), IRAP was involved in 35 at their early stages of the firm. A few other assisted firms were on stock exchanges but have since been taken over.
3. Of \$2 Billion raised in new capital for biotechnology firms from 1991-96, early IRAP assistance helped firms get established which were subsequently able to raise over \$1.5 B. These firms were not always based on the original IRAP supported technology, but creation of the team carried on in many cases. Also other government assistance programs may have been involved also. For the same period, the University spin off biotech firms raised \$1.2 B of the \$2B mentioned above.

4. To put the IRAP / Canadian stock exchange activity into perspective, in the WHOLE of Europe there are only 61 biotech firms listed - mostly on London LSE. (Genetic and Engineering News 1998 Sept)

As well, the Technology Partnerships Canada Program could provide useful examples of partnership arrangements involving public-private sector alliances. The Networks of Centres of Excellence Program and Agriculture and Agri-Food Canada's research partnership Program could provide examples for intellectual property agreements as well as alliance criteria.

There is a wealth of information within the federal government alone and this resource could be more aggressively tapped by IDRC. Contact information for each of the programs mentioned is available from BIOTEC Canada.

Division of Projects into Developmental Research and Commercial Application Phases

Several natural product projects have involved both developmental research and the application research results into commercial opportunities. The criteria for successful outcomes for each segment of the project differs considerably. Commercial application requires different expertise, partnerships, infrastructure, contacts, intellectual property distribution, financing, monitoring and evaluation to ensure a successful outcome. It may be feasible, in some instances to separate these project phases or to create two separate projects, each with its own criteria and milestones.

Division into separate entities would enable the development research component to be managed as has been successfully accomplished within IDRC for many years. Commercial application of research results, on the other hand, may require the following to be considered during development of the Project Identification Memorandum (PIM):

Does the applicant possess the experience, contacts and infrastructure to commercialize a product?

Are suitable partnerships in place to deal with scale-up, manufacture, packaging, marketing and distribution?

Has the intellectual property from the first phase been adequately protected in the developing country and in other potential markets?

Is there adequate financing in place to overcome the commercialization hurdles without a reliance on immediate product sales?

Have market size assessments, marketing plans and market entry strategies been included?

Has the proposal identified suitable and verifiable milestones on which to monitor and evaluate the project?

Attention to these questions during proposal development will help to ensure that the commercial application will have a chance for success. The proposal should be reviewed by one or more consultants or experts on commercialization of research results, during the PIM stage, to assess the practicality of the concept.

Project Management

To provide consistent and orderly management of projects with commercial endpoints, standard project management procedures are required. These procedures vary little between private and public sector projects since they focus on project planning and cycle control, work definition, work activity planning, scheduling budget and materials handling. In order to increase the success of commercial ventures, standardized project planning systems should be supported in IDRC through staff training or increased use of project management professionals to support the project team. One option to minimize costs may be to work with Bates Inc. of Ottawa or other project management

consulting firm to develop a training package for developmental research projects which could be attended and jointly paid by IDRC and CIDA staff.

In general the project planning process should include developing the scope statements, work plans, scheduling and budgets. Scope statements include the identification of the project team, general description of the project, end products, organizational issues and priorities and the work activity breakdown control points.

The work activity planning provides an overview of each stage of the work broken down by elements into inputs, products, resources, time frames, approvals and decision points. The project schedule provides an optimal time/cost mix while ignoring the availability of resources. Work activity planning is then revised to maximize both time and cost factors and the schedule updated. Budget control planning is required to place payments at key decision points related to verifiable milestones. Materials flow planning attempts to forecast the needs of significant equipment or other material resources, again to minimize the time/cost continuum. Each of these components of the project management plan should be incorporated into contractual documents and carefully monitored to ensure both compliance and positive net results.

Criteria for Natural Product Project Selection

The following general selection criteria should be considered when selecting the most suitable natural product projects which are intended to commercialize research results:

Management capability, expertise and experience

Sound and experienced management is the single most important criteria to ensure the success of any scientific or business venture. Unfortunately, it is often the most under-rated of the selection criteria for many projects carried out in emerging economies, often propelling the project toward disaster. In the developed world as well, an experienced management team is critical to ensure a successful outcome. Venture capital firms use the management experience test as the number one decision point. Even for projects which have leading-edge science and strong market opportunities, investment is only made by venture capital where strong management and leadership is in place.

Local Entrepreneurial Leadership

Only a very limited number of projects supported by IDRC, CIDA and other development agencies around the world include a local entrepreneur as the driving force behind the project development. Rather, the projects are initiated, implemented and assessed by the academic or government participants. This does not bode well for successful commercialization of the project results nor for integration of the adapted technologies into local industry. As well, the adapted technologies often tend toward academic interest rather than solving an identified commercial need (technology push vs pull). Researchers have as their mantra, the search for knowledge, not necessarily striving for economically sustainable activity. Strong linkages with local entrepreneurs increase the likelihood of commercial success after the end of the feasibility and research component of a project. Providing solutions to industrial problems or providing new market opportunities go hand in hand with eventual commercial success and integration of adapted technologies into local industry.

This hurdle to success for commercial projects may be the most difficult for IDRC. Not-for-profit organizations, research centres, universities and other non-government organizations are often poorly equipped to deal with commercial projects. To increase the chances for commercial success, whenever possible, project leaders should be for-profit private sector corporations or successful individuals with expertise in developing, manufacturing and marketing products. IDRC may have to overcome the lingering distrust of the private sector if they wish to facilitate the development of successful commercial ventures. In order to help overcome this distrust, diligent monitoring and evaluation processes will have to be instituted.

Scientific Validation

Prior to undertaking any venture which includes a scientific component, it is common practice in business and government to ensure that the project details are reviewed by a group of scientific peers. In both economic and social development programs, this review should include consideration for state of the science, language barriers, existing infrastructure, data and voice connectivity, access to pivotal equipment, adequately qualified personnel and opportunities for training. Scientific peer review panels are required to ensure that limited IDRC funds are properly allocated only to those projects which have scientific merit. These scientific peer review panels should include representation from both developing and developed nations and should, as far as possible, include representatives from international research organizations involved in the field of study.

Financing

Project financing often combines both cash and in-kind contributions from a variety of sources. The costs for developing a product from concept to successful commercialization can be enormous. The initial costs for feasibility studies and research are usually one of the smallest portions of the total development cost (with the possible exception of human pharmaceuticals). The process scale-up, production, marketing and distribution costs tend to require the lion's share of financing to ensure success. This can be problematic for many small start-ups. Financing is often available through international development agencies and research grants to help off-set the feasibility and early research phases. Just as the funds begin to dwindle, the need for cash rises substantially for facilities, raw materials, skilled human resources, regulatory and bureaucratic hurdles, advertising, storage, transportation, distribution and a range of other costs. Without considerable cost and effort to secure adequate financing sources at the outset of a project, few will overcome this considerable impediment to market entry. Some life science firms use a 90/10 ratio for costing, where 90 per cent of the commercialization costs are incurred after the proof of concept or prototype has been proven to be effective and prior to any cash flow from sales. This commercial reality should be considered when providing financing to early stage projects and some form of assurance that the remaining funds have been identified and allocated should be included in the project review.

As well, natural products projects may have to compete for a limited pool of venture financing with a vast array of other projects. Even in Canada where the life sciences basks in a supportive business environment, in 1997 only 21% (\$383 million) of total venture capital investment was placed in life science firms. Of that, almost 60% was invested in large, second round financings. This shows that even in mature economies, the investment community is becoming more risk-averse, having negative implications for early-stage business opportunities throughout the developed and developing world. What is even of greater concern in the move away from investments in food, feed and natural products by the venture capital community. A paltry 0.05 per cent of the venture investment in Canada went to these sectors in 1997.

Products, Markets and Distribution

For many research projects, the end product may not have been fully determined during the project definition phase. This makes it most difficult to forecast the market size, entry strategy, distribution system and a variety of other considerations required to ensure a successful product launch. Although this may continue to be the case, final product definition and some level of information gathering on potential markets, competition and competitors, transportation, storage and distribution should be considered for each project which includes aspects of product development or long term economic transformation.

Separating the project phases into developmental research and commercial application may enable distinct requirements to be built into each project portion of the project plan. Once a potential product has been identified, market research is required to ensure that the end user wants the product, the size of the market and what the user is willing to pay. In planning for a commercially successful project, it is often useful to have an economist or successful business person undertake this component of the proposal development.

Technology Transfer Opportunities

Research projects tend to provide benefits through immediate employment, training and cash flow to the community. Longer term benefits, however, should be the goal of every project. These include the opportunity to transfer the research results to the local industry so that they can be adapted and adopted to support the local economy. Technology transfer is a very complicated process which can only be achieved through personal contact between the research teams and the local entrepreneurs. Some level of integration between the researchers and the industry must be maintained throughout the project execution if the technology is to be successfully transferred.

The developmental research and commercial phases of a project are best led by different individuals with complementary but separate skill sets. The research leader can be guided by the entrepreneur toward the most economically viable alternatives whereas the entrepreneur can be guided by the research leader toward the most technically feasible process option. It is the cross-fertilization of experience and knowledge that creates technology transfer. People sharing ideas with other individuals is the key to successful transfer. Projects should be formulated to maximize the opportunities for such sharing between the scientific and entrepreneurial teams.

Intellectual Property

There are two major belief systems related to intellectual property (IP): those that support strong protection of IP and those that believe knowledge is the world's common heritage and therefore should not be owned. Traditionally, developed nations tended to support the former and developing nations the latter. This is no longer the case. Through the development of international agreements such as the Biodiversity Convention, ownership of both traditional knowledge and genetic resources is provided to the sovereign nation rather than to Mankind. Access to genetic resources and related traditional knowledge without an accompanying sharing of benefits from the use of that knowledge or resource is now considered "biopiracy". These same concepts form the basis for intellectual property protection laws which exist widely in the developed world. Knowledge and resources are assets for which a price may be demanded by those with ownership from those that wish to benefit.

Advanced informed agreement, mutually acceptable terms and equitable sharing of benefits have become the mantra of several recent international agreements. These concepts and terminology are already reflected in most IP systems in the developed world. It is now time that this attitude shift is reflected in the development research programs being supported by IDRC and other international granting agencies.

Without adequate IP protection for the results of research programs, private sector partners will remain on the sideline and economic gains are unlikely to be realized. The involvement of IDRC in the protection of IP may require some cultural change since unrestricted dissemination of information and little recognition for the intrinsic value of that information has tended to be ingrained into the IDRC value system. Without adequate attention to protection of IP, those IDRC projects which are intended to provide significant economic impact are doomed to failure.

At present costs for IP protection for some natural product projects is paid by IDRC outside the project budget. Often the developing nation research partner is ceded the rights within the country of origin or region and IDRC retains the rights for the rest of the world. IDRC is commended for taking steps to protect IP generated from some of its projects, a step not often undertaken by other granting agencies. However, further steps should be taken to maximize the adoption of the IP and provide incentive to commercialize it. These could include automatically providing Canadian private sector project partners with rights for North America or other lucrative markets, ceding rights in the developing nation to a for-profit project partner or establishing a node of expertise to market the IP and other products from projects to potential buyers around the world.

Operational Efficiency

By striving to reduce unnecessary generation of low value by-products or generating waste, more efficient operations will result. Efficiency gains can also be made by identifying secondary markets for waste and by-products. Examples of secondary markets could include bioactive compounds, animal feed, composting, soil humus additives and other novel uses. Project proponents should be

required to identify such potential uses for by-products and devise a plan to adequately deal with them.

Information Dissemination and Linkage to Other Projects

Linkages with other projects sponsored by IDRC and other support institutions around the world is carried out in a haphazard way. Final reports are collected in the IDRC library and catalogued with a title and date. This reduces the utility of the information since it is often difficult to locate and rarely possible to cross reference. There is considerable room for improvement of the information management system currently in practice.

Lessons learned and Canadian contacts made through one project could, in some instances, be applied to activities in other geographic regions or for related end products. To be successful, an improved information cataloguing and retrieval system would have to be devised. As well, a more concerted effort is required to collect and key word suitable information as an integral part of project documentation. As well, project proposals should include a due diligence component requiring a wide bibliographic search (inside and outside IDRC), to minimize duplication of effort and avoid intellectual property pitfalls.

Many IDRC projects related to medicinal plants have been undertaken under the auspices of the Environment and Natural Resources as well as the Sustainable Use of Biodiversity Units within the Biodiversity Conservation Theme. These projects have similar structure, content, targeted research and endpoints and include grants in the millions of dollars. In a business environment, considerably more communication and co-management of such similar projects would be considered essential to derive the greatest benefit from the limited funds. As a minimum, data links and information sharing systems would be formalized to require cross fertilization of ideas and inventories. Perhaps a more structured approach to information sharing should be considered by the IDRC project teams.

Project Monitoring and Evaluation

Canadian industry and investors alike have learned through experience that one of the single most important concepts for management to grasp, is to recognize when to walk away from a losing investment. These same lessons have not yet been adopted by the majority of federal research granting programs. Many projects which deviate substantially from their work plan, lose key participants, fail to meet milestones or report poorly, are soon listed among the failures in the Program dossier or are discontinued after the federal grant has expired. The research results tend not to be adopted by the community or the industry and the final reports languish in libraries, unused.

In order to minimize these situations, improved project monitoring and evaluation techniques should be embraced by IDRC and other research granting agencies. These should include tightening of the Memorandum of Granting Conditions and associated contract documents, improved reporting mechanisms, use of Canadian consultants as project managers, revised payment schedules and establishment of local advisory teams.

Tighter control points should be incorporated into all contract documents, providing the means to carefully track project expenditures against project or technical milestones. Decisions to halt projects, withhold payments or cancel contracts have to be taken in a more timely manner. The monitoring and evaluation process as well as the decision process to place a project on hold or discontinue it, must be streamlined and removed, as far as possible, from the political process. Project Managers should have the responsibility to impose "stop notifications" on any project under their control which, in their judgement, has failed to meet a milestone or has substantively deviated from the work plan. Such deviations should include loss of partner, missed technical or economic milestone, change in research or management staff, change in local political or economic environment, loss of important infrastructure and other situations which could have a negative impact on the project. "Stop notifications" should remain in place until the situation is resolved to IDRC's satisfaction. As well, these "stop orders" should be reviewed by the IDRC

management to determine if contract termination is required. Unfortunately, there are few federal programs, particularly those related to development work, which have perfected such a system and most granting agencies continue to allow “losing” projects to languish without instituting a federal exit strategy. This situation (avoiding termination decisions) squanders our limited human and financial resources.

Canadian Consultants as Project Managers

Many federal programs now rely on private sector consultants to bolster departmental human resources and enhance the collective experience available to manage projects. Natural products projects are excellent examples where private sector consultants could provide benefits to IDRC through strict project review and selection processes, ensuring an adequate level of due diligence and facilitating positive results by applying their considerable experience in this type of activity. The existing human resource pool in IDRC is not adequately trained in some important areas of commercialization and they have had little experience guiding commercially relevant research activities. The use of Canadian consultants as project managers will lower the cash available for research however will provide higher economic, environmental and social impacts from the research results.

Revised Payment Schedules

In many cases, payment has been provided based on the calendar rather than achieving project milestones. As well, significant up-front payments are often incorporated into the schedules. Date dependent payments (i.e. fiscal or calendar year-end) tend to be a disincentive to delivering on project milestones. The documented achievement of project milestones are the preferred payment criteria for commercially relevant research projects, providing performance-based incentive to the research teams. However, this approach places increased importance on the creation of reasonable and attainable research plans during the development phase. Overestimating the ability to reach a specific milestone or underestimating the time and resources required, could sever the flow of funding and place the project in jeopardy. These are the new realities facing both research team leaders and granting agencies.

Establishment of Local Advisory Teams

In order to gain from the experience of both local entrepreneurs and other researchers in the developing nation, many projects could benefit from the formation of Advisory Teams to mentor the project leader and researchers and to facilitate the incorporation of the research results into the social and economic fabric of the local culture. The use of mentoring teams has been widely adopted in Canada, especially for small start-up organizations. As well, scientific, financial, legal and economic advisors are often sought as members of the Board overseeing such projects.

Caution must be exercised when selecting such an advisory team to ensure that conflicts of interest are overcome. Family members, government leaders and those in a position to personally gain from the project are poor members for such advisory teams.

Establishment of Nodes of Commercial Expertise

One considerable hurdle to successful commercialization of research results from natural products projects is the ability to internationally market the products in a cost efficient manner. Low production capacity, limited product lines and niche markets are realities for this type of industrial venture making marketing activities for individual products expensive. It may be worthwhile for IDRC to consider establishing a central clearing house for the South and Central American region to facilitate the international marketing of natural products. A study should be undertaken to determine the feasibility of establishing a regional centre with one or two people to assist in the identification of potential products and markets, develop marketing plans for each product, approach potential international buyers and complete the sale agreements. The centre could also assist the local industry to adapt, package and distribute the products to meet the needs of international buyers. Co-location with some form of existing regional infrastructure could

help to keep costs low and build on existing linkages.

Conclusion

IDRC is beginning to broaden the impact of research programs to include an economic development aspect and, in some cases, to assist in the commercialization of technologies developed with IDRC support. Several IDRC personnel have even suggested that IDRC should be able to recoup some of its investment in research through a royalty stream on successful commercial products arising from the research. This could be seen as a significant step away from the traditional granting agency role into a more complex investment partnership arrangement. There are few examples of such dramatic change among granting agencies anywhere in the world that could be considered success stories. Such a move would require significant cultural change, adaptation of the organizational mission and objectives and refocusing core competencies of personnel.

Senior management should carefully consider such a shift in objectives and the impact that these changes will have on their operations including the requirement for different personnel abilities, new information and project management systems, use of experienced consultants and the affects on client groups in developing nations.

Recommendations

The project prioritization and selection system should be carefully reviewed to ensure that it will continue to meet the changing needs of both IDRC and its client groups.

IDRC Project Managers should collaborate with Project Managers from other federal government departments thereby increasing their experience base and drawing on the experience of others.

Where projects include both research and commercial phases, the project plan should separate these phases, each with its own criteria and milestones, or to create two separate projects.

Proposal should be reviewed by one or more consultants or experts on commercialization of research results, during the PIM stage, to assess the practicality of the concept.

Standardized project planning systems should be supported in IDRC through staff training or increased use of project management professionals to expand the project team.

Project selection criteria should be altered to include the following:

- Management capability, expertise and experience
- Local Entrepreneurial Leadership
- Scientific Validation
- Financing Products, Markets and Distribution
- Technology Transfer Opportunities
- Intellectual Property
- Operational Efficiency
- Information Dissemination and Linkage to Other Projects

Improved project monitoring and evaluation techniques should be embraced to include tightening of the Memorandum of Granting Conditions and associated contract documents, improved reporting mechanisms, use of Canadian consultants as project managers, revised payment schedules and establishment of local advisory teams.

A study should be undertaken to determine the feasibility of establishing a regional centre to assist in the identification of potential products and markets, develop marketing plans for each product, approach potential international buyers and complete the sale agreements.