

**SURVEY, REVIEW AND ASSESSMENT
OF 33 COMPLETED
TECHNOLOGY-BASED IDRC PROJECTS**

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EXECUTIVE SUMMARY

The International Development Research Centre has, for 28 years, successfully worked with communities in the developing world to find solutions to pressing social economic and environmental problems. The success is based on involving people in their own development by supporting projects and the work of Southern researchers and scientists, in many cases collaborating with those in more developed countries. The span of activities has included a number of completed technology-based projects which are the subject of this study and review. The review includes 33 projects located in 20 countries, and covers a broad range of technologies and industry sectors, and was conducted by eight separate consultants working on projects in various regions of the world.

The results and conclusions indicate that IDRC continues to fund and manage successful initiatives with broad developmental effects, reach and impact. The study also indicates, however, that effects and outcomes can be better designed, organized, implemented and managed, leading to improved performance in accomplishing IDRC's basic mission and objectives.

Investment in research and development by IDRC normally occurs in response to needs determined by people in the developing world. Review results indicate this major criteria requires prioritization and emphasis. The desire to increase and improve developmental effects, gain added impact and enhance outcomes lies in:

- applying good management resources and techniques to all projects having IDRC provide consulting support;
- consideration and application of market planning, marketing techniques, technology transfer and dissemination strategies early on in the project cycle;
- ensuring projects are inclusive, open and involve major stakeholders including users/beneficiaries, government, industry and researchers from

- initiation and throughout;
- providing good IDRC support and monitoring throughout the project;
- having resources available through alliances and partnering for second stage and further development;
- ensuring that financing and dissemination mechanisms are available to users and beneficiaries to ensure widespread adoption and use of results in projects that are not commercialized or offer a lot of economic incentive to delivery agents.

The review has identified thirteen high potential projects which present major opportunities for IDRC in commercialization, increased developmental effects through further dissemination presenting a good possibility of revenue generation and high value from a public relations perspective.

The recommendation is that IDRC pursue these projects and apply resources, management and support moving to active commercialization and added technology transfer activities to improve the outcomes of these selected technologies groupings.

INTRODUCTION

Investment in research and development plays a key role in creating sustainable, long-term practical solutions to pressing development problems. The Industrial Development Research Centre (IDRC) mission of “Empowerment Through Knowledge” sets a sound base to create, maintain and enhance research capacity in developing countries and thereby expand socio-economic activity and opportunity with all the resulting impacts and benefits. IDRC projects normally occur as a response to needs determined by the people of those countries and are typically conducted under a project leader working within an institution which is directly funded by IDRC. The institution provides administrative support and possibly facilities.

The project leaders assume responsibility for the research with monitoring by IDRC staff.

There have been approximately 5,000 projects funded by IDRC over the past 25 years which represent a major strategic contribution to capacity-building, development of new networks and linkages, and increased economic and social activity.

This study examines 33 completed technology-based IDRC projects (see Appendix Table 1) in order to explore factors which have contributed or constrained commercialization of results. The study reviews research inputs, activities, outputs, impact and reach, while attempting to determine which projects may offer additional commercial development and opportunity.

OBJECTIVES OF THE STUDY

The objectives of the study were to:

- 1) to identify and analyze completed IDRC projects to determine their benefits and impact, and to assist the Centre to improve its performance;
- 2) to identify and assess project outputs which can lend themselves to further use of and application of research results, commercialization, future economic benefits and/or courses of action including communication of IDRC activities and results to support CENTRE public relations initiatives;
- 3) to recommend future courses of action considering lessons learned and potential impact through diffusion of results.

Seven field consultants were engaged to visit project sites to meet with and interview project leaders and others, view and discuss research outputs and provide overview and analysis reports on each project. The interviews and discussions focused on the project planning activities, human resources, implementation, direct and indirect results, additional outputs and potential for further application, commercialization and extended activities and impact. (see RESEARCH REVIEW FRAMEWORK - Figure 1)

RESEARCH REVIEW FRAMEWORK

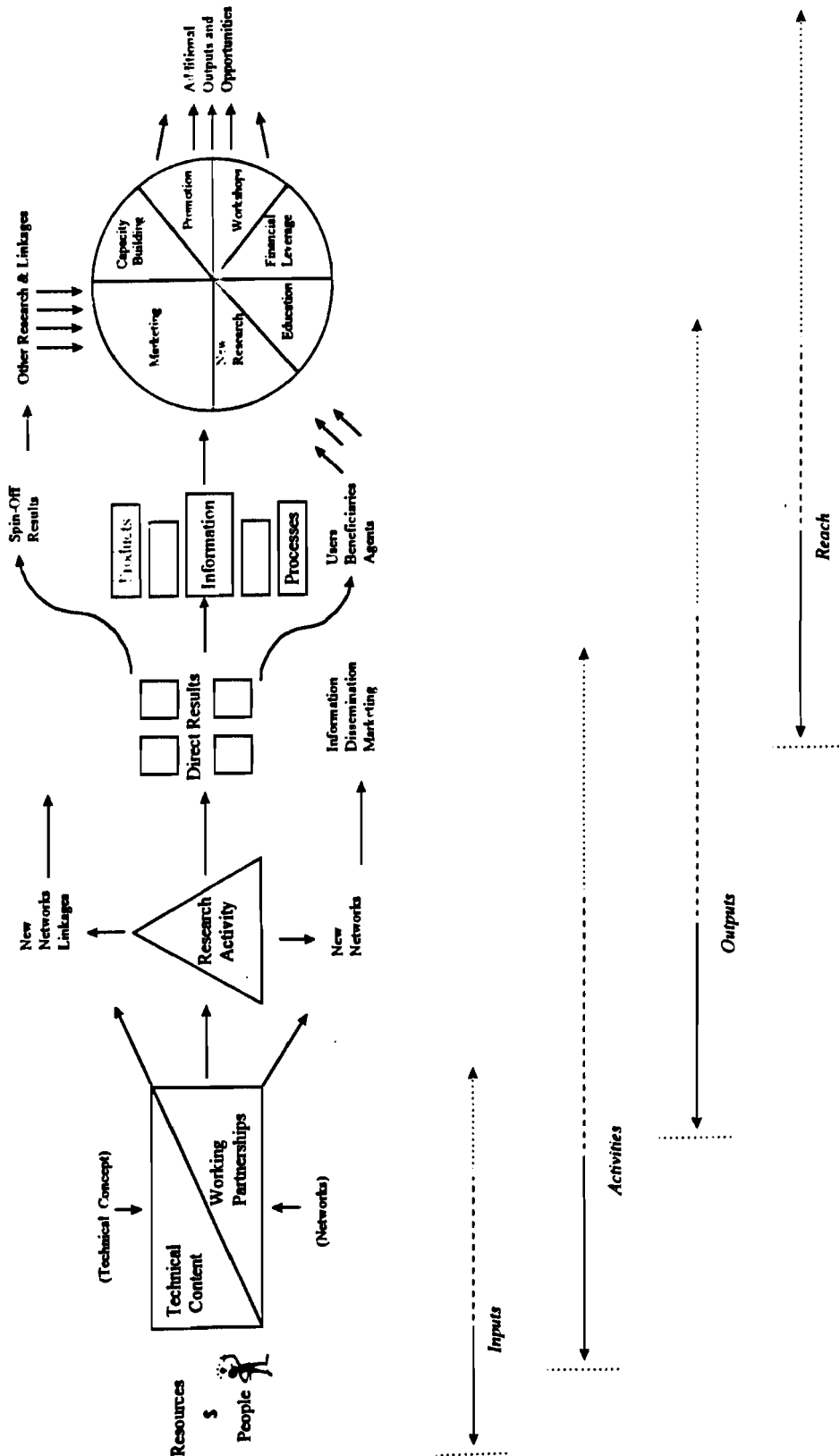


Figure 1

The project attempts to select and give a brief overview of projects that have demonstrated significant outputs to date and presently offer opportunity for commercialization and/or expanded potential for enhanced impact.

There are many variables that can affect future opportunities and performance of project results, as the potential is based on considerations such as continuity, human resources, timing, funding, linkages, deal making and/or the entrepreneurship skill of project leaders.

ORGANIZATION OF THE PROJECT AND FINAL REPORT

The report presents an overview and analysis of the interview and project analysis reports and results. These outcomes and results are detailed in a condensed form in Appendix Table 2 parts A and B. The detailed information regarding each project can be accessed by reviewing the interview reports which are detailed and are designed to determine the outputs and potential from several points of view (see attachments). The synthesis and analysis provided by each consultant consider the viewpoints of different project participants including project leaders, users and beneficiaries that provide different perspectives, and indeed at times, contradictory information. These reports and interviews were submitted as supplemental information to this report.

PROFILE OF IDRC PROJECTS

The projects reviewed are comprised of technology-based research and development efforts with the aim of exploring information gathering, classifying, innovating for process and product development (prototype development), training and dissemination of outputs including the technological information and other results. The activities in many cases have resulted in dissemination systems development including extension services activities, prototyping of products and processes, development of training programs, production and marketing of products as a part of commercialization efforts.

The majority of the projects met the stated project objectives and resulted in publication and dissemination of results by researchers, companies, government agencies, NGOs, or other stakeholders. Projects in a few cases fell short and resulted in scientific activities exclusively, and can be considered failures.

Project overviews can be seen in the following Appendix Table 2 parts A and B which provide a consolidated review of the most important project issues. These include reach, activities, outcomes, users/beneficiaries, results, impact and lessons learned with brief comments on potential. The desired overviews are available and contained in the consultant produced interviews and project overviews.

METHODOLOGY

The assignment to John Holub of Technology Services Group Inc. (TSG) was to act as the primary consultant to design and coordinate a commercialization study of completed IDRC projects. The study involved identification, visits and examination of projects by seven individual field consultants to examine factors that have contributed to or constrained commercialization of IDRC-funded technologies.

The project involved the review of 33 projects in 21 countries with field visits conducted during the period of September 1997 to June 1998. The specific tasks under Phase I of the project included:

- a) assistance in selecting the final list of projects;
- b) participation in developing contracts between IDRC and the individual field consultants which reviewed projects in specific geographic regions;
- c) developing a methodology and research framework with appropriate guidelines and documentation for analysis;
- d) visiting two projects to test the methodology and revise guidelines as required.

Phase II of the Study provided coordination of field consultant activities, including telephone briefing and de-briefing sessions.

Phase III activities resulted in the preparation of a final report which provides an analysis and synthesis of individual field consultant reports in a format which uses analytical tools developed specifically for this study. The results and findings are presented as conclusions regarding project design, documentation and reporting, and a commercialization model followed by specific recommendations

SUMMARY OF FINDINGS

CLASSIFICATION OF THE PROJECTS

The results shown in this analysis highlight the fact that the projects with high ranking for project performance of objectives and in application and impact also are judged to have the highest potential. This is an indicator of well resourced and managed projects which exhibit the traits and contain the factors which have been previously considered in this report.

Table-3 PROJECT ANALYSIS - REVIEW/POTENTIAL

Project	Consultant	Country	Objectives	Application	Impact	Potential	Total
840193 AFS	D. W.	Peru	5	3	2	3	13
910216 MPS	D. W.	Chile	3	2	1	3	9
910236 CP	R. I.	Colombia	2	1	1	2	6
890039 CBB	D. W.	Mexico	5	5	4	5	19
841032 AC	R. I.	Colombia	5	4	3	3	15
870342 CDIH	R. I.	Paraguay	5	3	1	2	11
928750 AQH	D. W.	Peru	3	0	0	3	6
900289 HTEA	R. I.	Brazil	5	2	3	2	12
861008 COX	D. W.	Chile	2	0	0	1	3
870167/920610 RSF	D. W.	Chile - SATAL	5	5	5	5	20
871036 PTA-C	D. W.	Chile	4	4	3	4	15
900001 FS	R. T.	Jordan	5	4	4	5	18
851020 CFB	B. F.	India	5	3	3	3	14
920806 PUEJ	B. F.	Bangladesh	5	5	5	5	20
921301 BP	B. F.	Thailand	2	1	1	1	5
890280 CMLM	B. F.	Thailand	5	3	3	2	13

Project	Consultant	Country	Objectives	Application	Impact	Potential	Total
920011 CFT0	B.F.	Vietnam	4	4	4	5	17
870084 WPT	B.F.	Malaysia	5	5	5	5	20
880258 RCF	V.G.	Philippines	5	4	2	5	16
891035 EE	V.G.	Philippines	4	0	1	2	7
891005 ACUAI	V. G.	Philippines	5	2	2	4	13
920274 DD	J. K.	Senegal	5	5	5	5	20
911029 IVO	J. K.	Burkina Faso	5	4	5	4	18
901008 AP	J. K.	Burkina Faso	2	1	1	1	5
890019 PC	F. G.	Ivory Coast	5	1	1	1	8
891027 PFT	F. G.	Ivory Coast	5	2	2	3	12
911001 TD	F. G.	Guinea	5	2	2	2	11
920800 IBN	F. G.	Benin	5	4	5	5	19
880215/910158 AD	J. H.	Global	5	5	5	5	20
93/951013 FGB	J. H.	Global	5	4	4	5	18
901019/921452 WA	R. T.	Tanzania	4	3	1	5	13
900278 SITBM	R. T.	Zimbabwe	2	0	0	0	2
911051 RCT	R. T.	Zimbabwe	5	1	1	2	9

High Potential Projects

The projects considered to have the highest potential for replication, revenue generation and/or significant future impact are listed in Table 4. The analysis is a ranking which considers the interviews and consultants' comments, overviews and analysis presented in the ranking developed in Table 3. The final determination of the potential is based on the direct comparison of the 33 various projects using experience and judgement to determine which have the highest potential and present the best opportunity of success as determined by the reviewer.

The headings which have been selected for Table 3 – Objectives, Application, Impact, – categorize the important outcomes on a project basis while also considering the Potential for future opportunity. The rating system is designed to value the completed work in combination with any future opportunity which considers all of the important outcomes for IDRC and other stakeholders such as commercialization, further dissemination, enhanced developmental opportunity, public relations potential, broader adoption, training and human resource development.

The analysis is based on a scale of 0 - 5, with 5 indicating good results, and 0 unacceptable results. The value ascribed to each criteria for each project is based on a detailed review of the interview reports, overviews and comments of each consultant, and the judgement provided by having the opportunity to compare the results of all 33 projects by the prime consultant.

1

1	Production and Use of Enzymes for Juice	Bangladesh
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Table 3) may also offer some potential for specific public relations benefits and visibility, but would be dependent on the particular IDRC needs to highlight certain objectives and types of activity. The projects would have to be individually analyzed and reviewed against whichever criteria are specified.

PROJECTS WITH MEDIUM POTENTIAL

There have been some recommendations from the reviewing consultant related to the projects which are considered to have fallen between those considered as having low or no potential and those listed as high potential. These projects all have potential for use in public relations efforts and possible additional reach, however with significant additional effort, and include:

Table 5 PROJECTS WITH MEDIUM POTENTIAL

- 1. Andean Farming Systems – Peru
- 2. High Temperature Equipment Application – Brazil
- 3. Pine Tannins Anti-Corrosion – Chile
- 4. Circulating Fluidized Bed – India
- 5. Control of Manual Lathes – Thailand
- 6. Alternatives to Cyanide Use in Aquarium Industry – Philippines
- 7. Plant Fibre Tiles – Ivory Coast
- 8. Traditional Dyes – Guinea
- 9. Wood Adhesives – Tanzania
- 10. Rural Cottage Tanneries – Zimbabwe

PROJECTS WITH LOW POTENTIAL

Projects which have very low potential and were considered in most cases only partially to have met their objectives and resulted in little or no impact include:

Table 6 PROJECTS WITH LOW POTENTIAL

- | | |
|-----|--|
| 1. | Milk Production Systems – Chile |
| 2. | Cassava Processing – Colombia |
| 3. | Chagas Disease via Improved Housing – Paraguay |
| 4. | Adobe/Quincha Housing – Peru |
| 5. | Cuprous Oxide – Chile |
| 6. | Botanical Pesticides – Thailand |
| 7. | Electroplating Effluents – Philippines |
| 8. | Anthocyanic Pigments – Burkina Faso |
| 9. | Plantain Conservation – Ivory Coast |
| 10. | Schistosomiasis Intervention Trial – Zimbabwe |

The above listed projects offer little opportunity for either commercialization or added public relations use. In some projects, the results have created negative perceptions, and could be studied as cases by IDRC to avoid negative consequences in the future.

NATURE OF THE PROJECT POTENTIAL

With exception of the Water Pump, Mosquito Bed Net, and Dehuller projects, the impact and effect has been local and limited. The potential impact for all of the projects listed in Table 4 provides the opportunity for significant leverage in commercial and social development through expansion of the projects both nationally and internationally by replication and/or new partners and business arrangements. The input requirements in some cases are large in terms of human and financial resources which can only be achieved through partnering and alliances.

See Projects:

#89-0039	Coffee Berry Borer	Mexico
#87-0084	Water Pumping Technology	Malaysia
#88-0258	Rainwater Collection with Ferrocement	Philippines
#91-1029 / #93-1013	Inedible Vegetable Oils	Burkina Faso
#95-1013	Fish Gene Banking	Global

In some projects there is an opportunity to develop revenue streams for all partners including IDRC if the expansion is managed properly and the commercial benefits are considered and are built into the expanded activities.

See Projects:

#87-0167/#92-0610	Remote Sensing for Artisanal Fishing	Chile
#92-0011	Commercial Floraculture Transfer of Orchids	Vietnam
#90-0001	Foundry Sands	Jordan
#92-0806	Production and Uses of Enzymes for Jute	Bangladesh
#84-1032	Activated Carbon	Colombia
#92-0274 / #88-0215	Dehuller Development	Senegal
#91-0158	Aids Diagnosis	Global

This has not been a major focus of IDRC to date in fulfilling its mandate in the projects reviewed.

Significant potential also exists in these projects and some others not highlighted (see Tables 3 & 4) for increased dissemination of results, technology transfer, limited commercial development, public relations, and IDRC profile enhancement.

The most successful projects demonstrated the need for demand driven research with active user/beneficiary involvement.

The absence of market oriented components or support for these activities in the project design was an identifiable weakness in limiting the adoption of results and reach of many projects.

Improved IDRC monitoring, evaluation and involvement enhances project outcomes by supporting reorientation on a timely basis to reflect the current project needs and stages of development. This Activity highlights the importance of **management** in all phases of the project by proponents and funders.

The most successful projects, resulting in significant outcomes with wide reach and impact, exhibit similar features and elements related to planning, execution, implementation and wider dissemination. The project objectives in 70% of the projects were met (see Table 3 as denoted by ranking of 5) and at least partially fulfilled in the majority of the others. The broader development objectives, however, to a large degree have not been maximized due in part to the type and nature of the projects and targeted beneficiaries, and also the lack of high priority given to achieving commercial benefit from the outputs or products of research resulting in little or no incentive in many projects for the private sector to become involved. In some projects, the business case cannot be made as the product cost is too high or the product is inappropriate for the intended market. In other projects, even though the technology is appropriate and there is a demand on a local or regional basis, there are problems with production, lack of resources and/or financing. These projects require that financing or direct financial assistance be in place to support purchase of products. In other projects, commercialization and dissemination has been successful on a limited or local-regional basis, but the mechanisms to duplicate this nationally or across borders does not exist and it is a major undertaking to put mechanisms in place to accomplish this without significant organizational and resource inputs. For products such as the Water Pump Technology (Malaysia) to expand the market and migrate the product into other countries, a major consideration is protection of the intellectual property through patenting or other means.

Serious commercial interest for products which have large markets in many countries is largely dependent upon having the appropriate product positioning to protect your interest and support wide exploitation and export. Barriers to significant market development and penetration include regulatory environment or the not-invented-here syndrome as there are always other, possibly local, competing products. If the technology is not adequately protected, the research results are difficult to represent as having great value. The technology is perceived to be, or is in the public domain and it may be difficult to maximize the returns to stakeholders. Companies are free to use the results as they wish without considering compensation to any stakeholder. The only leverage in such cases may be know-how or trained people who have specific talents and experience.

GENERAL COMMENTS ON REACH AND IMPACT

As a general comment, the reach and impact in all projects can be enhanced and improved. The projects listed as having the highest potential (Table 4) offer the greatest opportunity for further promotion, dissemination and use with possible monetary returns to IDRC if the process is organized and managed properly. These high potential projects have been selected and highlighted on the basis of a direct comparison between the outcomes and potential of all the projects studied, and applying the judgement and experience of the reviewers to the exercise.

The reach of IDRC projects has, even in what might be termed the most successful projects, been either limited or at best regional. The results and outputs have been under exploited even in the most successful projects. In some projects, such as the Remote Sensing Technology (Chile) which was applied on a large scale, the reach and impact can be greatly enhanced by migrating the technology and systems approach to other countries such as Peru, or to Africa. The process, mechanisms and management must be put in place to achieve this result. A most effective mechanism to accomplish this could be to use the project as it presently exists to train and develop other users and agencies in

exploiting these results. This model could be used in other projects as well, particularly in Africa.

FACTORS AFFECTING PROJECT SUCCESS AND IMPACT

The most important factor regarding all aspects of project success and/or lack of success can be described as management. The quality and extent of management applied in each case has the most significant and direct bearing on the outcomes, dissemination and use of research project results.

The following listing denotes the important factors contributing to project success:

- Projects require good leadership;
- Inclusive project design with early involvement of all stakeholders including users/beneficiaries, government, industry and researchers;
- Good IDRC support and monitoring;
- Research directed toward satisfying user needs;
- Open administration with rapid access to funds;
- Early involvement of competent professionals for scale-up and entrepreneurial activities of appropriate industry partners;
- Funding available for additional R&D second stage activities, dissemination and training;
- Availability of credit and financing for user (villagers, farmers, small producers) purchase of products resulting from projects;
- Mechanisms and relationships in place to make the seamless transition from research to development and dissemination.

It is apparent in studying projects under review that the lack of one, or more of the above listed elements contributed to the lack of their success and precluded any potential for future consideration of further effort by IDRC.

Actual use and commercialization of the results took place in projects that were inclusive, well managed and brought in users/beneficiaries and potential disseminators of the results (including industry and government) early on in the project. Having regular evaluation through monitoring and review allowed the projects to move through various stages following a normal progression.

Developmental Effects

The greatest difficulty in achieving large developmental effects in the projects are the challenges presented in multiplying and exploiting the project results to a high level of duplication and penetration which, incidentally, is one of the objectives of successful commercialization. The projects which are directed toward users and beneficiaries who are poor with limited or nonexistent mechanisms to allow for easy dissemination of results, or distribution of products provide limited incentive for industry or governments to put in place the required infrastructure to support using new technology or research results to benefit the intended users. This presents the obstacle that, in many projects, the mechanisms for dissemination must be built and put in place or at the very least the requirements must be considered early on in the project and appropriate industry, user groups, and/or government agencies be included early on to ensure wide use of results. The logistics and organizational requirements for replication and training can be an enormous undertaking as demonstrated in the Coffee Berry Borer (Mexico) project which, while a very successful project with good second stage planning and consideration early in the project's life, could have had much greater impact and reach early in the project's life cycle. While some consideration has been given to dissemination, duplication and commercialization of results, projects under review did not exhibit the kind of emphasis in planning and execution consistent with the enormity of this need in the majority of projects.

The possibility exists to develop templates of workable models for various types of projects through case studies, sharing of results and experience and using personnel and

successful programs to demonstrate techniques, systems and outcomes between various projects at various phases of development.

With closer monitoring and more frequent evaluation, projects may have the opportunity to change direction as results or conditions indicate and bring in critical resources in a timely fashion as required. Most projects offer little hope of commercialization and expanded results without large resource inputs and restarting research efforts to achieve more acceptable results either to users or in the marketplace with commercially acceptable outcomes.

Analysis of Table 3, and Appendix Table 2 and provide more details on specific projects.

Users and Beneficiaries

The projects have resulted in a large number of users and beneficiaries which make use of the outputs of the projects in both direct and indirect ways. The users and beneficiaries are listed in Appendix Table 2 along with results and impact for each project. However, in many projects the developmental changes are significant only for small regional groups of people such as villagers, farmers and fishermen who participated directly in the project or were located in the area or region nearby and within the networking range of project participants, delivery agencies or IDRC. **In projects where industry, strong delivery agents, government or its agencies became involved as sponsors, collaborators or delivery agents, the benefits and developmental effects are greatly enhanced and results were more widely disseminated and adopted, more people were trained, more acceptable outcomes and products resulted; providing and creating jobs, particularly for women, improved environmental conditions, better and cheaper end products, increased incomes for users, with significant new policies and governmental programs created in some instances affecting public health and safety and the environment.**

This is quite evident in the results obtained in projects such as the "Production and Use of Enzymes for Jute" Project #92-0806, carried out in Bangladesh, where collaboration between the International Jute Organization (IJO) and Islam Jute Mills (a private company) resulted in wide dissemination of results to developing country members of IJO and a marked increase in the primary market for raw jute, increasing the price received by small farmers. Ministry of Health involvement in the "Water Pumping Technology" Project #87-0084 (low-cost hand pump) in conjunction with a private company resulted in the formation of a private company to produce the pumps. 12,000 pumps were produced to 1998, with 1,200 exported to 13 countries in Asia, Africa and South America. (See Appendix, Table 2) This correlation emphasizes the need for an understanding and inclusion of a marketing component to the projects which considers marketing and dissemination of research results and outputs as strongly as the research component. In marketing terms, this relates to the distribution system of providing the product at the right price, with proper promotion at the right place (4 Ps of marketing). This analogy is appropriate in viewing the need for determining partners and mechanisms for dissemination to be considered and put in place early on in a project's life. It is evident from the projects under review that this major link in the chain of events leading to commercialization, wider dissemination and adoption of results and much greater impact is a need to place more emphasis on this component.

In several large expensive projects directed toward villagers and farmers (Milk Production Systems, Andean Farming Systems, etc.) the prime beneficiaries were the researchers. This result can be viewed as professional capacity building rather than seeking application and impact.

Benefits to IDRC

The important benefits to IDRC lie in meeting its major organizational objectives which the review indicates have been met in a majority of the projects. The analysis, however, indicates that there is substantial opportunity to leverage the projects' outcomes and expand the benefits to all parties by better project design, monitoring and resourcing, while placing more emphasis on the total project requirements to coincide with broad IDRC objectives and taking full advantage of project outcomes. The opportunity to leverage the results exists with proper vision, resourcing and management which must be approached in a more global or business oriented manner.

The benefits to IDRC in the reviewed projects show developmental changes in approximately one third of the projects, with significant ongoing potential in a total of two thirds of the projects. There was negligible or negative benefit or impact in the remaining third. The development and effects/contributions of the reviewed projects have mainly supported:

- the reduction of poverty in localized areas and improvement in living conditions;
- improvement and modification of environmental effects from economic activity and resource exploitation;
- improvement in management techniques of local users and beneficiaries;
- some limited movement to sustainable development in specific areas and sectors of activity while developing new products, processes and systems;
- improved living conditions of local populations;
- development of new networks including electronic;
- improving employment and competitiveness of local populations;
- development of new enterprises and organizations through innovation which includes agencies and extension groups;

- contributing to new policy development at local, regional and national government levels which inherently includes modifying large industry sector policies and programs;
- capacity building for technological development and training;
- use of IDRC resources in marshaling resources from other groups and agencies to support project and developmental objectives.

EFFECT ON LARGE ORGANIZATIONS AND BENEFITS TO OTHER STAKEHOLDERS

In some of the projects local, regional and national government policies were altered or influenced by projects. Additionally, other aid agencies provided support with the IDRC projects exerting significant influence on their projects which have been designed to leverage each other's results.

Results achieved in the "Impregnated Bed Nets" Project #92-0800 in Benin and region demonstrate the leverage and influence on other agencies and government programs which are possible in well conceived projects. The Project contributed to the emergence of a National program within the Ministry of Health. (See Appendix Table 2 part B). Significant government involvement with resulting impact on government policies is clearly evident in the "Inedible Vegetable Oils" Project #91-1029 in Burkina Faso where the Project has resulted in generally improved conditions and increased production for groups of village women participating in the oil industry. (See Appendix Table 2 part B).

Large companies in the resource, energy, capital goods and health sectors were influenced by projects which directly impact on their business interests and in specific cases were forced to lower prices, alter environmental policies and adopt new methods to work with local or regional groups.

Some examples include the “Aids Diagnosis” Project #88-0215 which, global in nature, has forced large companies to reduce their selling price for test kits by 50%. In addition, environmental policies and new methods of parasite control were adopted in Mexican coffee production “Coffee Berry Borer” Project #89-0039 which has improved the environment while offering an effective biological alternative to spraying of insecticides.

A listing of benefits can demonstrate the very broad range and significance within the projects for local users and beneficiaries and includes:

- the development of new products, services and systems;
- capacity building usually confined within the region of the project;
- training of villagers, farmers, technical staff, government agents, researchers, and large numbers of women locally, regionally;
- development of new training programs and aids such as pamphlets, videos, articles and manuals;
- development of new organizations and facilities to deliver programs including extension services;
- new, positive environmental measures and effects (soil conservation, clean water, environmentally friendly products and practices, recycling);
- opportunity for employment and new extended product and process development;
- new agricultural crop varieties, animal strains, biological systems and building products;
- new industries, production units and co-ops;
- information and delivery systems;
- identification of new avenues of research;
- delivery of papers, presentations at local, national and international forums and specific workshops and conferences to disseminate research results and know-how;
- a large number of peer reviewed articles and publications;

- studies and surveys to support further work;
- identification of new natural resources.

There are positive benefits and outcomes for other stakeholders including researchers, NGOs, government departments and agencies, universities, community groups, private companies, industry associations and various international organizations both in the developing countries, and in Canada and other developed nations. The myriad of outcomes and outputs are substantial and must be reviewed on a project by project basis detailed in Appendix Table 2.

COMMERCIALIZATION CONSIDERATIONS

There are common factors which have contributed to the commercialization of some project results which include:

- projects designed to address needs or demand driven research (see Appendix Project #87-0084, Water Pumping Technology);
- identification and involvement of commercial partners in the early stages of the research project (see Appendix Project #92-0806, Production and Use of Enzymes for Jute);
- consideration of marketing factors such as distribution, pricing, financing, production, dissemination, and training (see Appendix Project #92-0274, Dehuller Development);
- competent leadership, management, monitoring and planning during all phases of the project, and consideration of second stage needs and positioning (see Appendix Project #91-1029, Inedible Vegetable Oils, and Projects #87-0167/92-0610, Remote Sensing for Artisanal Fisheries);
- inclusiveness, openness and involvement of major stakeholders (see Appendix Project #87-0084, Water Pumping Technology);

- availability and application of good human resources and required financing (see Appendix Project #92-0274, Dehuller Development).

Factors which are barriers to commercialization include:

- attempting to involve commercial interest after major decisions regarding the final product have been made or when the research is substantially complete;
- failure by researchers and other stakeholders to properly consider economic and business factors which affect the final results;
- under emphasis of this objective by IDRC and others in project design and performance, which results in lack of second stage or follow-on planning and commitment;
- failure to address important commercial considerations such as financing of pilot stage and demonstration activities;
- failure to address financing of final product purchase by intended users;
- the need to have resources available to support second stage activities;
- the need to address issues such as protection of intellectual property (patents, etc.), standards, government regulations, and export/import laws which are vital in some types of projects;
- lack of consideration of policies and actions to support IDRC position and best interests and objectives.

CONCLUSIONS

The results and impact of the projects covered in the review in total are substantial. The qualification and manipulation of the data developed in the interviews can be achieved through detailed review and analysis which is not possible under the terms and conditions of the present contract.

There has been an impact on policy discussion, development and modification by governments, agencies and departments associated with and as a result of all of the high potential projects, however it is difficult to assess extent or degree. This is evident in projects as diverse as the Coffee Berry Borer Project #89-0039 which has resulted in inclusion of parasatoid biological control in Mexican federal standards; the Impregnated Bed Nets Project #92-0800 in Benin and region which has influenced National Health Ministry Programs; and the Aids Diagnosis Project #88-0215 / 91-0158 which is global in nature and has impacted public health programs in several world regions. These are policy development issues associated with the larger projects that do not appear in Table 4. In order to determine and quantify these, there is a need to do a more detailed analysis than is possible at this time.

The projects which are judged to present the most potential for commercialization will require a team of competent, experienced professionals with adequate resources and entrepreneurial skills to delineate and quantify the specific opportunities. This is a difficult task and should be contracted to competent technology brokers and business people. The technology transfer and business related activities require a mix of technology management and marketing skills for deal-making, licensing, spin-off company development, joint venture and partnership development, and the ability to develop support within the various government agencies and departments with significant influence, in many regions, on the eventual success of new enterprise. These activities must be directly supported by IDRC in terms of funding, use of its substantial contacts and influence, direct

participation in the process, and for partnering and ability to bring other agencies and their resources to the table.

If IDRC has serious commercial expectations, stringent criteria need to be applied. This raises the question of the strength of linkages to other agencies such as CIDA, ADB, IDB, World Bank, etc. which have the resources to support commercialization

COMMERCIALIZATION MODEL

The process to develop commercial and other activity important to IDRC in pursuit of its objective can be achieved using competent outside agents in a team approach which includes the required outside resources and IDRC staff. The mix and number of participants will vary depending on the particular project as presently occurs in conducting the research projects.

A set of clear policies and objectives are required to guide the commercialization efforts which may use as a guideline the practices presently used by University technology transfer offices. While the activities and expectations of the organizations may differ to some extent, the commercial expectations may apply. Certainly the development objectives of IDRC are much broader and a separate consideration.

PROJECT DESIGN AND IMPLEMENTATION

The projects under consideration in this review were designed and conducted in a previous era at IDRC which did not consider or require economic benefits accruing to IDRC as a result of the project. If this was a consideration at the time of research project planning and design, the requirements relating to activities and outputs should have considered commercialization issues such as business planning, marketing, production, distribution and financial returns and provided funding and professional staff to support the transition

phase from research and pilot activities to the commercial stage and beyond. The projects under review left these activities strictly to chance and the opportunities that were created were either lost or not fully realized. All of the high potential projects are in need of second-stage financing and support. Presently, while the projects identified as having high potential can be exploited if the process is managed properly, the efforts to resurrect and/or expand on the results to date will present more of a problem. The effort required is greater due to discontinuity in the projects and the possible loss of knowledgeable human resources and changes in stakeholder groups.

DOCUMENTATION AND REPORTING

Documentation and reporting is ineffective, and in some cases non-existent, and needs to have stricter standards applied. Documentation regarding commercial aspects in support of extended activities is critical. Technical and scientific documenting is substantial as there is a direct added benefit to researchers to prepare and present activities and results. Some of the questions and information requested in the present review could be incorporated into reporting procedures. There is inadequate project follow-up in most projects studied. The projects showing better than average success and potential had above average project monitoring and participation by IDRC staff.

Suggested project reporting formats and milestones should be established by IDRC to ensure timely response from principle researchers, also using input from other stakeholders. The formats should incorporate and address the areas which are considered of vital importance to IDRC and would require detailed information on completed work and suggested actions on marketing, dissemination and promotion activities, training – user/beneficiary interaction and development, commercialization activity, areas of new research or second stage work, etc. There are report and evaluation formats which have been developed and can be reviewed and tailored as required for IDRC needs.

EXPECTED RESULT

It must be recognized that success rates for converting research to successful commercial products is low for all enterprises (in the range of less than 10%). The pay back for successful projects and resulting products can be very high in terms of revenues, profits, job creation, and various other measurements of success. In the case of IDRC projects with the considerations being more global and containing development goals, a project which creates a lot of economic benefit to the particular participants, region and/or country may not provide the opportunity for direct revenue back to IDRC. A particular problem in relation to production and exporting the technologies is that very little consideration has been given or action taken toward protection of intellectual property. This is an important consideration in commercialization activities if the industry partners wish to export or produce and sell the products in other countries. The IDRC approach can be modified to include this consideration with closer project monitoring and involvement of professional support to make the proper arrangements when required, and adequate resourcing and collaboration with commercial partners. Consideration of protection of intellectual property must be viewed strategically on a case by case basis, and is dependent upon market and marketing elements. The majority of the work completed has been published in open literature and presented at workshops, conferences, and seminars and cannot be protected. Knowhow and experience of participants and enterprises participating in the projects, however, do offer a basis to exploit technologies further, and there is the possibility that, in specific projects, trademarks, etc. can be achieved.

INNOVATION AND TECHNOLOGY COMMERCIALIZATION

IDRC is, in fact, involved in the least complicated part of the chain of innovation, and in many cases the least expensive phase. Many of the projects end at the study and/or demonstration of results and dissemination phase, with the add-on of extension services and limited trial and/or production and marketing in a region. A managed process to move

research through the additional phases of second-stage financing, full beta testing with identified business partners, development of a business and marketing process, and international marketing are all very challenging tasks.

The elements of the innovation chain and technology transfer are shown in Figures 2, 3, 4, 5, and 6. The cases reviewed indicate that resources and management capability to move from R&D to commercialization needs to be available at the appropriate time to make this objective achievable. The challenge is to reduce the time frames of the various project phases.

The IDRC projects all exhibit the difficulty of moving from the research phase to wide dissemination, implementation and commercialization. The comments and recommendations to improve this performance relate to management, IDRC objectives, resource availability and application, partnering and timing. The appropriate mechanisms can be put in place to more effectively manage outcomes if IDRC management takes the initiative.

THE INNOVATION CHAIN PARTICIPANTS AND PUBLIC FUNDING

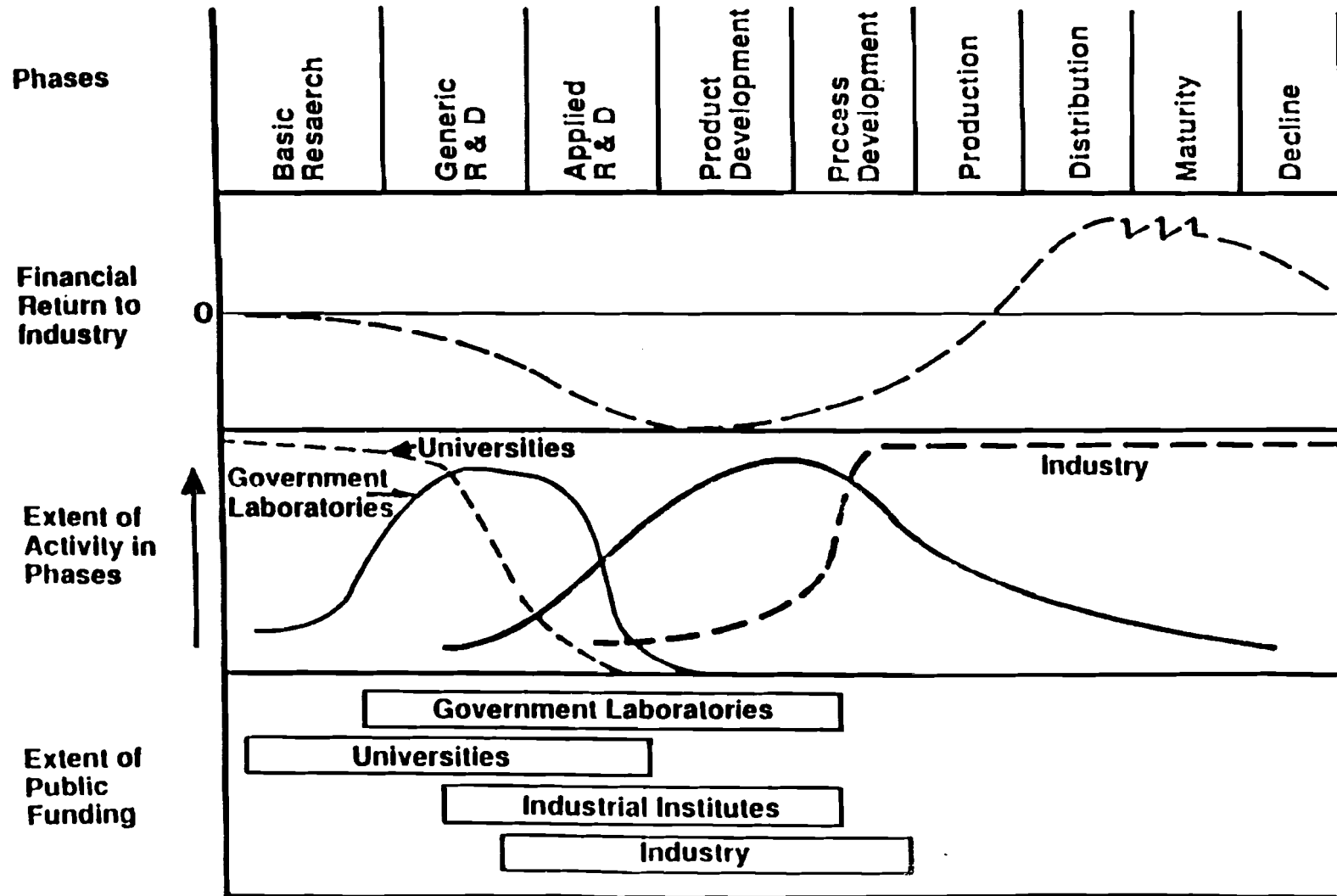


Figure 2

The technology transfer process

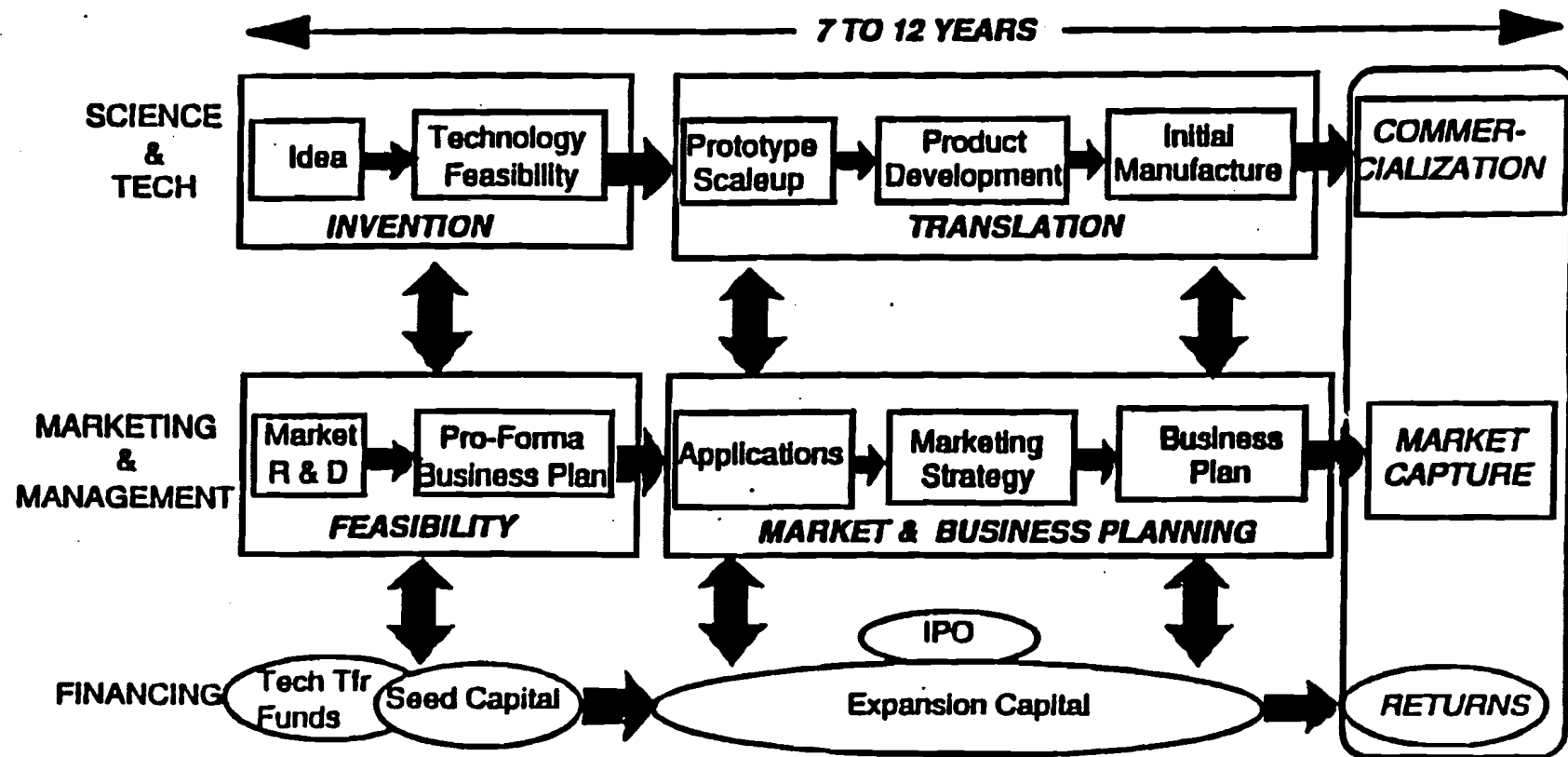
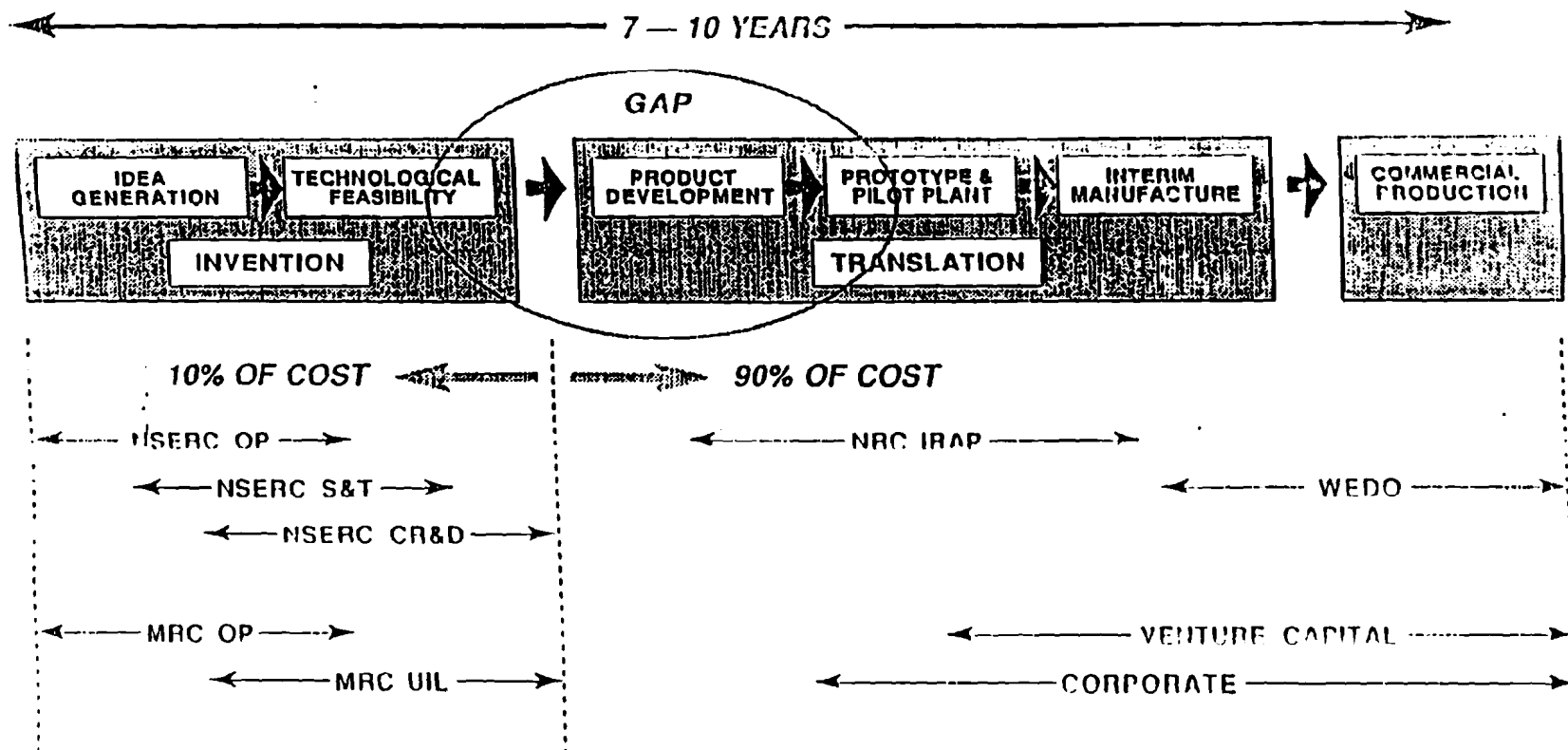


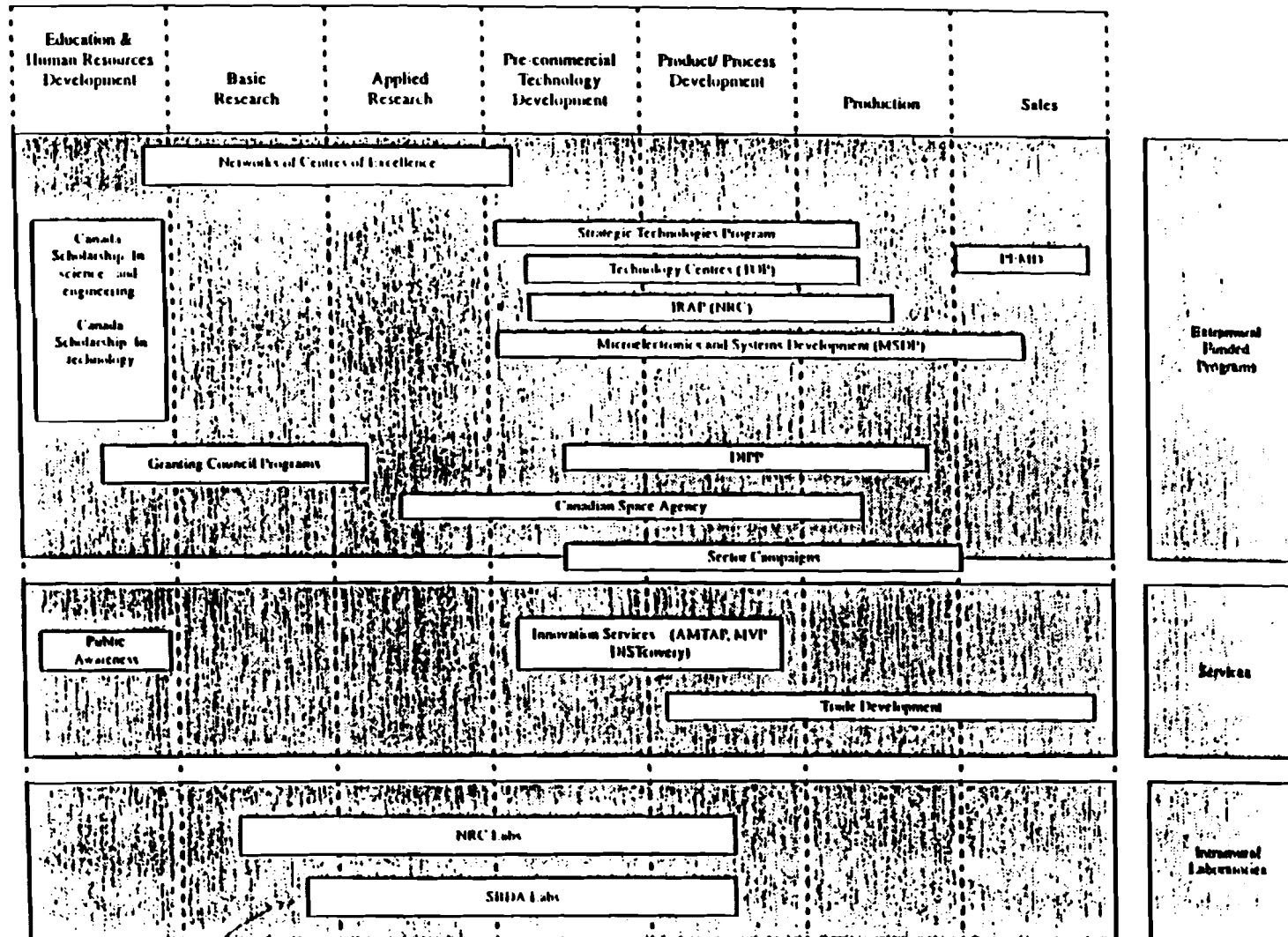
Figure 3



The Technology Development Gap

Figure 4

Elements of the Relationship Among Federal S & T Activities



Source: Industry, Science and Technology Canada

Figure 5

Research Continuum

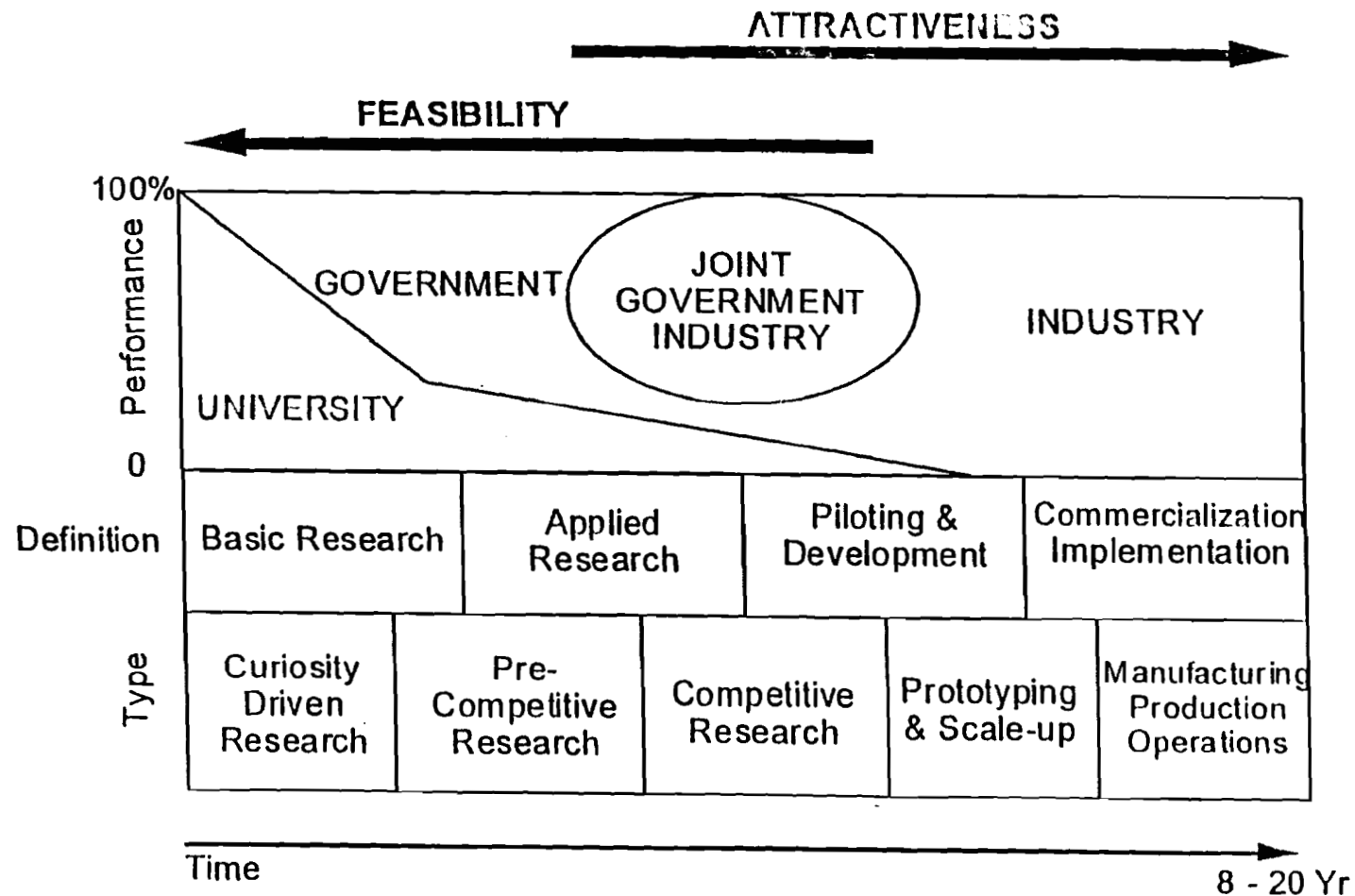


Figure 6

RECOMMENDATIONS

There are a number of recommendations which result from this project review. By considering and applying the lessons learned, IDRC will increase the benefits, extend the reach of projects and support additional support toward its developmental objectives in its future activities.

PROJECT DESIGN AND IMPLEMENTATION - IDRC

1. Commercialization, technology transfer, dissemination of results and promotional activity should be given a higher priority within IDRC projects.
2. IDRC should provide additional project support by developing a consulting mechanism to apply professional human resources and project management support to individual projects as part of the overall activity.
3. Project leadership and management needs to be supported with additional resources and monitoring by IDRC.
4. Project planning for second stage activities should be part of project activities.
5. **It must be recognized that large scale adoption and use is a much different exercise than local or regional adoption and/or capacity building.** The wide dissemination of results is tied to having the appropriate mechanisms available which can vary in each case. This involves a wide variety of options and is tied to leadership, management, alliances and partnerships, contracting organizational development, capacity building and funding. IDRC should concentrate a significant effort to study, evaluate and document for its use the various options which may be pursued and applied in all projects. In many countries the infrastructure is available

to support these activities, but in most cases there are few options or fragments of what is required which necessitates an understanding of the needs by IDRC and the subsequent availability and mechanisms to support the requirements resident in each project.

6. An understanding of the importance of final product economic viability must be inherent in project planning and delivery.
7. Reorientation of projects as required must be recognized in many cases as crucial to success.
8. It is recognized that project design impacts directly on final outcomes, results and reach indicating that it is desirable to attempt to support and develop entrepreneurial research teams.
9. IDRC should avoid projects which are based on technology push or academic curiosity driven objectives unless it is clearly understood these are to accomplish research and capacity-building objectives.

PROJECT IMPLEMENTATION - RECIPIENT

1. Projects need to be designed and operated as open, inclusive activities bringing in industry, delivery agents, disseminating groups early on in project life.
2. IDRC projects should be designed to address needs or demand driven research (commercialization and dissemination plans addressed in the project application).

3. The mechanisms to support additional stage activities (research, product development, training, partnering, contrasting, etc.) should be in place and support by IDRC and other agencies or partners (based on successful models).
4. Mechanisms for developing community based promotion, training, extension services, co-op and/or village groups should be available as case studies and models that can be used to broaden adoption of results.
5. The use of local expertise and skills in product development and marketing should be maximized.

COMMERCIALIZATION ATTEMPTS

1. The projects identified as high potential projects should be pursued, with additional resources to support commercialization, technology transfer and public relations activities.
2. Linkages of IDRC to other agencies (World Bank, IDB, ADB, CIDA) to support second stage activities requires additional effort.
3. Marketing and financial considerations must be incorporated into projects to ensure that second stage and follow-on activities are adequately addressed to support the greater use and impact of results.
4. The subject of protection of intellectual property needs to have clear policies, and the will and resources to protect IDRC and stakeholder positions to ensure opportunities and benefits can be maximized.

5. Regulatory and standards considerations need to be addressed (adoption and commercialization issues) and the required actions supported to ensure widespread dissemination of results.
6. The use of university and research personnel to lead and/or undertake commercialization activities should be considered only as a last resort and only with appropriate additional human resources or partners.

DOCUMENTATION AND MONITORING

1. Timely project planning, reporting and documentation must be incorporated into projects.
2. Additional mechanisms for networking and sharing of experiences could be developed based on the use of personnel and mechanisms used in successful projects being made available to projects in the planning and implementation stages. Standard courses and seminars can be developed to support this need.
3. IDRC staff monitoring and confidence building within projects is an important component for success and continuity and must be considered a priority.

APPENDIX

Table 1 LISTING OF PROJECTS
LACRO

Project #	Title	Country	Recipient	Sector	Amount CAD	Dates
840193	Andean Farming Systems	Peru	INIPA	Agriculture	235,000	1985 - 92
910216	Milk Production Systems	Chile	PUC	Agriculture/Technology	803,000	1985 - 92
910236	Cassava Processing	Colombia	CIAT/UNIVALLE/ IIT	Agriculture	750,000	1984 - 95
890039	Coffee Berry Borer	Mexico	CIES	Agriculture	198,100	1990 - 94
841032	Activated Carbon	Colombia	UNC/RMC/ QUEENS	Natural Resources	300,000	1985 - 91
870342	Chagas Disease via Improved Housing	Paraguay	CTA/IICS	Housing - Medicine	659,490	1988 - 92
928750	Adobe/Quincha Housing	Peru	PUC	Housing	213,100	1992 - 96
900289	High Temperature Equipment Application	Brazil	FTSM/MCS	Technology	200,000	1984 - 92
861008	Cuprous Oxide	Chile	Catholic Univ.	Technology/Industry	98,850	1986 - 94
870167 920610	Remote Sensing in the Artisanal Fisheries of the Valparaiso Region	Chile - SATAL	UCV	Fisheries	390,000	1988 - 93 1993 - 97
871036	Pine Tannins and Anti-Corrosion	Chile	Universidad de Concepcion	Technology/Industry	107,600	1988 - 91

MIDDLE EAST - MERO

Project #	Title	Country	Recipient	Sector	Amount CAD	Dates
900001	Foundry Sands	Jordan	IPI/NRA/RSS	Industry	135,800	1990 - 93

SARO

Project #	Title	Country	Recipient	Sector	Amount CAD	Dates
851020	Circulating Fluidized Bed	India	BHEL	Industry/Tech	500,000	1987 - 91
920806	Production and Use of Enzymes for Jute	Bangladesh	IJO	Industry/ Biotechnology	461,137	1992 - 96
921301	Botanical Pesticides	Thailand	SSMU/Univ of Ottawa	Agriculture	665,000	1989 - 92 1992 - 94
890280	Control of Manual Lathes with Microprocessor	Thailand	IST	Industry	110,000	1990 - 94
920011	Commercial Floraculture Transfer of Orchids	Vietnam	HAU	Agriculture	130,000	1994 - 96

ASRO

Project #	Title	Country	Recipient	Sector	Amount CAD	Dates
870084	Water Pumping Technology	Malaysia	Univ of Malaysia Univ of Waterloo	Housing	1,112,917	1992 - 94
880258	Rainwater Collection with Ferrocement	Philippines	CDFI	Construction	302,500	1984 - 89
891035	Electroplating Effluents	Philippines	ITDI/SRC	Industry	237,000	1990 - 92
891005	Alternatives to Cyanide Use in the Aquarium Industry	Philippines	HARIBOM Foundation/ IMAC	Fisheries	172,930	1990 - 92

AFRICA - WARO

Project #	Title	Country	Recipient	Sector	Amount CAD	Dates
920274	Dehuller Development	Senegal	CNRA/SISMAR/ PRI	Agriculture	589,567	1986 - 96
911029	Inedible Vegetable Oils	Burkina Faso	IRSAT/CRIQ	Agriculture	490,834	1986 - 96
901008	Anthocyanic Pigments	Burkina Faso	University of Ouagadougou	Industry	303,000	1989 - 93
890019	Plantain Conservation	Ivory Coast	Univ of Abidjan	Agriculture	218,740	1989 - 94
891027	Plant Fibre Tiles	Ivory Coast	ENSTP/NRC	Industry - Housing	405,650	1991 - 95
911001	Traditional Dyes	Guinea	PERTEGUI	Industry - Agriculture	281,140	1991 - 95
920800	Impregnated Bed-nets	Benin	OSSD/McGill	Medicine	222,900	1992 - 94

GLOBAL

Project #	Title	Country	Recipient	Sector	Amount CAD	Dates
880215 910158	Aids Diagnosis - Phase II & III	PATH/Global	PATH	Medicine	103,070	1991 - 92
931013	Fish Gene Banking	Global	IFT/Van Aquarium	Fisheries	159,000	1994 - 95 1995 - 98

EARO

Project #	Title	Country	Recipient	Sector	Amount CAD	Dates
901019 921452	Wood Adhesives Phase I & II	Tanzania	TIRDO	Industry/ Technology	380,000	1993 - 97

ROSA

Project #	Title	Country	Recipient	Sector	Amount CAD	Dates
900278	Schistosomiasis Intervention Trial with a Botanical Molluscicide	Zimbabwe	BLAIR	Medicine	242,290	1991 - 96
911051	Rural Cottage Tanneries	Zimbabwe	DTC/TECHNO- TAM	Agriculture/ Industry	228,900	1993 - 96

Table-2 part A

LISTING OF PROJECT OUTCOMES

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
84-0193 Andean Farming Systems	Peru LACRO	Farmers; INIPA Extension Service; Other Communities; Formation of local NGOs	Support, Expand agricultural research & extension programs, Study farming systems, Training program, Farmers & Tech. Staff	Alternate farming system provided to small farmers; Delivery of extension services; Soil conservation measures; Academic articles, workshops; Feasibility studies; Training pamphlets and manuals; The provision to farmers of improved crop varieties and animal strains and funding to ensure future availability	Farmers in 7 villages (50 - 80 families in each); Strengthened extension service; Imitation adoption by neighbouring communities
91-0216 Milk Production Systems	Chile LACRO	Pontifica Universidad Catolica (PUC); INIA, INDAP, COLUN (Milk Co-ops) Latin American RISPAL Network; Small farmers	Test and tech. transfer of improved milk production systems by small farms - regional; Monitor changes in farm systems and the environment	Upgrading of skills of researchers; Development of farm simulation model software; Identification, testing of component technologies; Agency staff training	Principal researchers, beneficiaries and RISPAL network; Delivery agents; Small participating farmers (2% of potential users)

Table-2 part B

LISTING OF PROJECT OUTCOMES

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
84-0193 Andean Farming Systems	Peru LACRO	Incomes increased by 15 - 20%; No market for excess produce.	Project successful but very costly with limited impact; Some increase in small farmer production and income; The adoption by farmers and communities of soil conservation measures	Success due to inclusion of farmers at outset; Project built on existing user practices; Linkages improved, IDRC staff provided regular input; Lack of input from post harvest experts; Close effective IDRC/CIDA partnership; User group too small and limited; Outputs specific and regional.
91-0216 Milk Production Systems	Chile LACRO	Principle users are the researchers themselves; Few benefits for end users; The agencies not now continuing promotion of the system; Limited impact, 160 farmers as user participants represents 2% of potential users.	Project has contributed little to deliver solutions to small milk producers in the region;	The project seems to have focused on strengthening research capacity, not delivering outputs to farmers; The large investment and support for 9 years of research resulted in only partial adoption of outputs by 2% of potential users; Scientific capacity building with small user base unlikely to achieve high visibility or public impact; Needs of small producers still exist, little opportunity for replication in other areas; Scientific capacity building via modeling systems possible.

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
91-0236 Cassava Processing	Colombia LACRO	CIAT; University of Valle; IIT; FONDODRI; COAPROALGA (Farm co-op); FUNDIAGRO (NGO)	To expand cassava flour industry in Colombia by converting a pilot operation to commercial production; To develop methodology for production and understand factors affecting cassava flour quality; Promote dissemination of information and technology in other countries - Latin America, Africa, Asia	The project failed to meet the objectives; As the business aspects of the project were lacking, the results were for the most part academic training and publications	The results of the project indicate no use to date and beneficiaries are limited to the researchers and project sponsors involved;

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
91-0236 Cassava Processing	Colombia LACRO	There was an ineffective and inefficient pilot plan constructed;	Limited impact based on project ineffectiveness	Operational funds for the pilot plant inadequate; Services such as electricity, water and gas were unavailable for the pilot; Raw material supply inadequate; Capability and capacity of management inadequate; Most of the project funds did not reach beneficiaries directly; IDRC should be used only as a resource with operating personnel at arm's length from researchers and IDRC

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
89-0039 Coffee Berry Borer	Mexico LACRO	CIES (ECOSUR), URPCT,JLSV, MOSCAMED, ISMAM (NGO) Local farmers and community groups Agents from other states in Mexico, El Salvador, Guatemala, Honduras; Researchers from Guatemala, Honduras, El Salvador	Mass rearing of parasitoids in Tapachula; establish parasitoids in Mexican coffee plantations; Introduce new species ; Carry out bio- ecological studies	Establishment of a growing and expanding population of parasitoids in Chiapas State; Development of techniques for small farmers to rear parasitoids in rural units; Training and technical assistance to farmers and communities; Training of participants from other countries; Academic publications, international workshops; Dissemination of technical assistance	Local and regional farmers; Extension workers; Participants from other countries ; State agencies; SLSV ; ISMAM (NGO)

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
89-0039 Coffee Berry Borer	Mexico LACRO	Inclusion of parasatoid biological control in federal standards for coffee production in Mexico; Reduction in infestation from 18% average to 1 - 2% after 3 years of control; Incomes of users increased by about 10%; Expanding population of parasatoids; MOSCAMEDs participation negative due to spraying practices	Large majority of states' coffee plantations not using biological control results of the project; 5% of producers applying biological control; Massive rearing program required to achieve high impact	Application of the research the result of a timely response of the needs of potential users; The technology coincided with new government policy for control; Timely development of techniques enabling farmers to rear and liberate parasatoids; Active participation of delivery agents; Strong project leadership; This technology can be applied in other areas of Mexico and other countries; New rearing technology required.

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
84-1032 Activated Carbon	Colombia LACRO	National University of Colombia; Royal Military College; Queens University; United Nations	Development of a process to produce activated carbon for use in the purification of drinking water; Development of lab-scale process,	Feasibility studies for up-scaling of process; Process patent issued in Colombia to the UN; Expanded interest of public and private organizations in activated carbon in Colombia	Project research staff; United Nations; Carbon group (University)
87-0342 Chagas Disease via Improved Housing	Paraguay LACRO	CEDE/ONG; Catholic University (CTA); Universidad Nacional de Asunción (IICS) WHO; PAHO; CYTED	Evaluation and documentation of intervention programs (insecticide application housing improvement and a combination); Recommendation of appropriate strategies for the control of Chagas Disease; Documentation of community participation; Evaluation of shelter improvement interventions	Reports and publications; Knowledge and knowhow disseminated to researchers; Capacity building	Researchers; WHO; PAHO; CYTED Rural population

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
84-1032 Activated Carbon	Colombia LACRO	Prototype process to produce activated carbon; Articles and presentations and a Colombian patent	Little impact to date; There is interest in the process but the technology has not been licensed	The University has limited experience in commercializing technology; The UN appears to consider the results to be exclusively theirs; Potential if financing provided for treatment plants from other sources (IDB)
87-0342 Chagas Disease via Improved Housing	Paraguay LACRO	Improved professionalism of associated researchers	Impact of the project is low although intervention is effective but costly with long time frames	Project outcomes promising but due to lack of government interest there is little prospect of expanding the dissemination of results; Project team discord hindered dissemination of outputs; Implementation of interventions include intrinsic problems regarding funding vs long term effects and population size; Potential for the project is low

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
92-8750 Adobe Quincha Housing	Peru LACRO	Pontifica Universidad Catholica (PUC); Town council; House purchasers; Local government; Local contractors	Pilot project for low cost earthen construction housing; Build and market 20 houses.	14 houses constructed at a high cost; Unhappy house purchasers due to poor finishing and lack of essential services; Improved adobe construction; Trained workers; New anti-seismic designs, and construction manual	Intended beneficiaries were the home owners.

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
92-8750 Adobe Quincha Housing	Peru LACRO	14 of 20 homes built; Poor quality construction; Town Council failure to fulfil an undertaking to provide water sewerage and electricity for the project.	Negative impact as project designed to promote interest and acceptance of this type of construction.	Factor which facilitated application of research outputs was provision of long term mortgages; Factors which impeded application - poor final product, added expenditures due to delays, failure of Piura Town Council to meet its agreed commitments ; Poor monitoring by PUC and IDRC staff; Failure to ensure long term financing for adobe housing; Low cost housing shortage still exists, key factor is the need for low cost financing and acceptance of technology.

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
90-0289 High Temperature Equipment Application	Brazil LACRO	Brazil - FTSM; IBP; ABCM; UFJR Canada - MCS	Transfer of technology for industrial steel alloys and promotion of utilization in Brazil, Colombia and Mexico; Focusing on major industrial sectors in the field of damage assessment and integrity evaluation for high temperature equipment	A facilitating organization, PROMAI, was formed for dissemination mainly to petrochemical and power generation sectors; The intended targeted industry sectors were originally conceived to be much larger;	Early project phase dissemination through scientific meetings; The targeted sectors of industry originally very broad; Petro-chemical and power generation sectors the only beneficiaries; ABCM and IBP providing services for inspection of smaller equipment; PROMAI; Petrochemical industry; Petroleum industry; Electrical industry

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
90-0289 High Temperature Equipment Application	Brazil LACRO	Meetings, conferences, seminars, videos, workshops covering national and international groups; Project results are highly visible;	Improved efficiency, reduced cost, improved planning and policy making; Added research funds; New non-profit organization created;	Dissemination has failed to reach some sectors of industry; Additional funding at the right time had tremendous impact for diffusion activities; High caliber leadership overcame project deficiencies; Potential to set up project extension activities on internet; Difficult to include smaller firms in conference and workshop activity due to cost.

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
86-1008 Cuprous Oxide	Chile LACRO	Catholic University of Chile; Queen's University; Brazilian Company.	Study anodic behavior of copper, produce Laboratory pilot; Construct pilot test cell.	Analysis and lab work completed, operating pilot cell not built; Technical problems encountered in scale-up; Academic articles in peer review journals	No users; Interest from Brazilian group late in project.
87-0167 / 92-0610 Remote Sensing for Artisanal Fishing	Chile - SATAL LACRO	Catholic University of Valparaiso; University of Chile; Small fishermen; National Fisheries Development Institute; Fishermen's Associations	To define functional methodology for using sea-surface temperature charts to improve locating of tuna and swordfish by small fishermen; The design and operation of a remote sensing service for small fisheries	Methodology and sensing service developed; Training courses for map and chart reading, and navigation to fishing grounds; Access to updated information which was previously only available to larger craft; Information extended to many types of fish; Course on sea surface temperature and publications	Fishermen, large and small; Catholic University of Valparaiso; Fishermen's associations; National Fisheries Development Inst.

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
86-1008 Cuprous Oxide	Chile LACRO	Results limited to analysis and laboratory work; Project abandoned.	Little or no impact other than peer reviewed scientific papers.	Problems encountered purely technical in scale-up from laboratory to full power; Project judged to have marginal economic impact even if successful, intended users 1 or 2 small chemical companies; Even if perfected, very narrow application potential.
87-0167 / 92-0610 Remote Sensing for Artisanal Fishing	Chile - SATAL LACRO	Income to UCV from selling charts; Large and small craft save time in searching for fish (save 50% searching time); generate added income; reduce costs (10 - 20% less fuel);	Impact on small craft fishermen larger than for large craft fishermen; Small fishermen now able to compete with large fishermen in access to updated information; Possible risk of over fishing	Success factors include an entrepreneurial multi-discipline research team; Good joint leadership and cooperation between participants; Early involvement of target group of small fishermen; Gradual implementation; Sufficient funds; Early identification of user needs; Potential in other parts of Chile, Latin American countries, Africa and South East Asia for replication

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
87-1036 Pine Tannins as Anti-Corrosives	Chile LACRO	Universidad de Concepción; McMaster University; Local Steel Company; Local Electricity Co.; Local Gas Company; Brazilian Manufacturer; Villagers; Maintenance companies	To develop and evaluate corrosion inhibitor from locally produced pine bark tannin for low carbon steels; Field testing of products developed; Technology transfer and commercialization	Revised objectives a result of negative findings from original research; Product produced added to primer paint which was transferred as a technology to the private sector; Product sold as an additive by the University trading agency; Presentations at national and international meetings (Brazil) and publication of results	Local maintenance companies, electricity company, fishermen, bark collectors; Brazilian users; Trials underway by particle board manufacturer

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
87-1036 Pine Tannins as Anti-Corrosives	Chile LACRO	Pine additive product being manufactured and sold; Revenues for University; Product use in Brazil; New use for tannins produced in Chile; Less coats of paint required	Limited to date; There is resistance to change by local paint manufacturers; Large marketing and distribution effort required; Some ongoing new jobs for local workers	Factors facilitating application - early involvement of stakeholders, entrepreneurial approach, timely change in objectives and methodology; Regular monitoring by IDRC staff; Early review of project results would improve potential and prospects; Component to support marketing and adoption of outputs required; There is potential for wider adoption in the region; Pine tannins have a clear cost advantage and the market is large.

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
90-0001 Foundry Sands	Jordan MERO	Royal Scientific Society; Industrial Petroleum Institute; Natural Resource Authority; Jordanian Foundry Industry; Business Groups (Investors); Middle East Foundry; Cairo Metals R&D Institute; Jordan Technology Group; Yarmuk University; Arab Engineering Company	Upgrading of molding technology in SMEs; Development and production of resin binder; Geotechnical exploration for silica sand; Performance of foundry trials; Pilot foundry trials	Silica natural resources identified; New capability in sand technology; Collaboration within a network; Training and workshops; New publications, international workshop and training of researchers; Dissemination of results to local foundries; New sand testing facilities in Jordan; New molding technology developed	Jordanian Foundry Industry; NRA, IPI; Business groups of investors;

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
90-0001 Foundry Sands	Jordan MERO	New investment in companies for mining activities (3 companies); Possible influence for investment in new foundry	Local employment created at foundry and mines; Large amount of silica resources identified with potential in glass, industrial chemicals and foundries; New mines are supplying Jordanian foundries and export; Pilot plant created for resin production; New technology not used for shell molding at present; Key researcher hired away to support development of a new state-of - the-art foundry	All components in place to exploit shell molding technology, need good industrial partners;

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
85-1020 Circulating Fluidized Bed	India SARO	BHEL (State owned electrical company); TUNS (Canada); International R&D Team; JV with Lurgi; CANMET; PETROMAS (Malaysia)	Optimal design for CFBC process; Construction of pilot test unit; Evaluation of various fuel compositions, namely low grade fuels, industrial and agricultural wastes (bagasse)	Pilot unit; Trained technical people; Prototype process; Dissemination of results; Strong ongoing linkage with Canada with TUNS (German Co.)	Regional power utilities; PHEL (State enterprise); International R&D team assembled;
92-0806 Production and Use of Enzymes for Jute	Bangladesh SARO	Bangladesh Jute Research Org. (BJRO); Private sector company; Villagers; Industry teams locally and India, Thailand, Pakistan, Indonesia and China	Improvement of the process of retting; Experimentation with various enzyme strains and optimum formulation of nutrients; Establishment of a pilot plant for production of enzymes; Application of enzymes at 7 jute mills	Prototype process and product in Bangladesh and IJO member countries; Landmark research papers; New process currently in operation at 6 mills; Training of mill operators; Improved markets for jute; Wide dissemination of findings	Villagers; Jute mills; Industry teams for enzyme production in the region;

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
85-1020 Circulating Fluidized Bed	India SARO	Dissemination of findings in developing countries; Continuing research effort; Several CFBC boilers sold to Indian clients	There are significant barriers to implementation of research results; More research required	A major barrier to commercialization is need for customization; A joint venture and partnerships with major organizations are the best option to expand use
92-0806 Production and Use of Enzymes for Jute	Bangladesh SARO	Decreased cost of production makes the product competitive for new uses; Increased primary market; More product sales at increased price; Measurable improvements in fiber strength and degree of fineness; Increased fiber brightness (higher grade product);	Project represents a major impact in jute production technology and results in substantial benefits to small farmers; The product is more environmentally friendly for new uses; Will create a new market for low quality jute	A barrier to exploitation is the wider dissemination of technical and economic benefits of the new process and fairly long pay-back for investment; Potential resides in new applications and new markets

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
92-1301 Botanical Pesticides	Thailand SARO	University of Chiang Mai; University of Ottawa	Screening of 300 locally grown plants for fungicidal pesticide activity; Formulation of two products for lab trials and testing	Some training of researchers	None
89-0280 Control of Manual Lathes with Microprocessor	Thailand SARO	Chiang Mai University; National Technical Centre of Metals and Materials; Metal working companies; Students and researchers; Sanyo Electric	The development of microprocessor control capability for lathes and milling machines to automate traditional manual processes; Demonstration of the capability of computer process control	Prototype computer automated lathe; Related patent applications; Lab demo project; Training program for machinists and operators; New technology, know how, publications, conferences; Nucleus for an instrumentation and control laboratory	Machine operators from SMEs; Engineering students and researchers; Sanyo Electric; Senior government program managers

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
92-1301 Botanical Pesticides	Thailand SARO	No reportable results	None; The project team is disbanded; The principle researcher would not make himself available for an interview	Business partner required at the outset; There is a barrier to the acceptance of botanical pesticides which are commercial (can't patent) and regulatory; Large companies appear to work directly against the interest of small farmers although promotion of botanical pesticides seems to coincide with sustainable development
89-0280 Control of Manual Lathes with Microprocessor	Thailand SARO	Production of 2 million compressor parts per year for Sanyo Electric; Improved equipment efficiency, higher quality with reduced waste; Competent research nucleus established;	New technologies in use; A large Sanyo contract; Process optimization with improved productivity with new commercial enterprises taking interest	The operation will grow with its own momentum and is capable of spinning off commercial enterprise; Can serve as a useful model for small scale industrial process control within the region

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
92-0011 Commercial Floraculture Transfer of Orchids	Vietnam SARO	Hanoi Agricultural University; Local Farmers	Introduction of modern tissue culture technology to commercial floraculture; Demonstration of commercial potential for orchid floraculture; Establishment of a tissue culture lab	Prototype production unit; Nucleus for tissue culture training in Vietnam conducting workshops; Feasibility study, marketing plan for pilot project; Publications, workshops	National/International Centre of Excellence of Tissue Culture; Japanese company considering commercial production of orchids
87-0084 Water Pumping Technology	Malaysia ASRO	University of Malaya; Ministry of Health; Villagers; GOAZ Development Company (marketing)	A revised design of a hand pump with initial production at U of M; Private company formed (GOAZ) for production and marketing	Production of a successful, low cost commercial product; Wide range of lectures, training programs and publications; Village level training for installation and maintenance; Policy development at the national level	Villagers in developing countries in Asia, Africa, South America; New private company (GOAZ);

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
92-0011 Commercial Floraculture Transfer of Orchids	Vietnam SARO	HAU Group has created capacity for developing commercial operation; 10 person research group in place	Some benefit to small farmers in the region; Capacity for commercial production	Funding required to develop pilot scale commercial production of orchids, with markets in Japan and Thailand; Potential for Japanese investment at the present time
87-0084 Water Pumping Technology	Malaysia ASRO	Approximately 10,000 pumps produced with 1,200 exported to 13 countries in Asia, Africa and South America; Large amounts of press and media coverage; Continuing practical training programs at village level; Prestigious national award to principle researcher for research and contribution to society (Dr. Goh)	In terms of dissemination, application and impact, this project possibly ranks as IDRC's most successful; The production of a low cost commercial product meets a critical need in developing countries	Although there is wide spread acceptance of this project in Malaysia, there are three barriers to expanding to other regions: Low cost of product, Competition from other designs of hand pump, Difficulty in finding reliable regional distributors. Keeping the product as a low cost, affordable unit results in minimal marketing fund availability; Potential to enhance the impact is via the export market; In order to have export oriented licensing, patent coverage is a critical element

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
88-0258 Rainwater Collection with Ferrocement	Philippines ASRO	Capiz Development Foundation (CDF); CIDA; Village homeowners; Contractors; National Economic Development Agency; UNICEF; Canadian Hunger Foundation; Asian Institute of Technology	Build and maintain 30 tanks in 3 villages; Develop and conduct training courses in construction, installation and maintenance; Established monitoring stations to record rainfall; Developed and tested a self-supporting financing system (with monitor)	Tank design and specifications; Pilot scale project implemented in 3 villages; Plan developed for full scale implementation of the program; Monitoring of rainfall in various parts of the province; Community workers hired and trained; Workbook and training programs	Village homeowners; Commercial contractors;

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
88-0258 Rainwater Collection with Ferrocement	Philippines ASRO	Ferro-cement design is unique; This simple method can be used by unskilled or entrepreneurial villagers; Larger capacity tanks can be constructed with low level technology	The results are significant in the villages used in the pilot project; This can be replicated throughout the region	The CDF director removed following new elections which affects continuity; Dependence on politicized organizations can have great influence over projects; Income generation possible from technology sale or licensing

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
89-1035 Electroplating Effluents	Philippines ASRO	ITDI; SRC (Canada); Department of Environment and Natural Resources; Electroplating Operators; Lake fishermen; Lake shore residents; Industry associations; NGOs; Laguna Lake Authority	The improvement of methods to minimize chromium waste generated; Developed chromium recovery technology; Developed process control methods	Patent application for treatment and recovery system; Pilot project developed; Prototype of new process; Research network developed; Dissemination of results to industry; Training and publications; Management information system; Processing system for plant site use	Local and regional governments; Laguna Lake residents; National government departments; Philippine Electroplating Association; Small electroplating shops; University researchers; Church and civic groups

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
89-1035 Electroplating Effluents	Philippines ASRO	Over 1,000 persons trained; 30 members of the Philippine Electroplating Association; Organizing training sessions; The pilot facility demonstrated the process of recovering chromium	Impact is low as there is a low level of confidence in cost effectiveness of recovery; Low level of use and implementation; Pilot plant is poorly located with respect to industry, and high cost of treatment wipes out profit (low operating margins)	Insufficient dialogue with users resulted in poor location for pilot plant; Public largely unaware of the need for pollution prevention; Economic benefits from recovering chromium are unproven, users prefer to pay fines than invest in treatment

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
89-1005 Alternatives to Cyanide Use in the Aquarium Industry	Philippines ASRO	HARIBOM Foundation; IMAC (Canada); Villagers; Aquarium fish collectors; Community organizers; Researchers; Trainers; Media; Government departments; NGOs; US Peace Corps; Local company (PMP)	Training of marine aquarium fish collectors to use nets instead of sodium cyanide; Training of basic reef ecology and teach safer diving practices; Demonstration of better fish handling; Communication of consequences of using cyanide and dynamite for fishing	Manuals, workshops and training programs; Formation of an export marketing company by co- ops; Development of small nets and compressors; Pilot facilities for export preparation; Feasibility on marketing plans; Web site and extension of research network	Fishermen; Exporters; Food fish consumers; Coastal villagers; Aquarium fish collectors; Fishery resource managers; Local government units; National government

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
89-1005 Alternatives to Cyanide Use in the Aquarium Industry	Philippines ASRO	Use of the new methods lessens the destruction of fish habitat and fish populations should increase; Commercial viability of the industry improved through the establishment of PMP (export operation); Job creation; Increased income	The project was successful in training fishermen to selectively harvest ornamental fish; Basic reef ecology and the value of conservation taught at the village level; The establishment of an export marketing facility by 7 fishing co- ops	Marketing plan needed at the outset; Potential if a large export marketing facility is put in place; Sustainable commercialization possible

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
92-0274 Dehuller Development	Senegal WARO	National Centre for Agronomic Research (CNRA); Prairie Regional Lab (Canada); Industrial Society (SISMAR); Villagers; Community groups; Rural, semi urban, and urban flour millers - Senegal, Gambia and Cap Vert	Build and test dehullers; Establish production methodology; Test and assess dehullers under actual operating conditions in the country;	3 models of dehullers designed and built; It was demonstrated that the dehuller is technically viable and profitable to produce;	Village and community groups in rural, semi urban and urban flour milling systems in Senegal, Gambia and Cap Vert; Consumers

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
92-0274 Dehuller Development	Senegal WARO	3 dehuller models of different sizes produced; 100 units manufactured and sold; Traditional dehulling method flour lasted one day before fermentation (wet process) New process is a dry process; Food product of a good quality at a good price; Reduced labour required; Increased revenue for cereal producers; Improved food security for Senegal; Increased consumption of local cereals, less imports	Impact is huge for a significant portion of the population, and contributes to food self-sufficiency in Senegal; The dehuller was a missing link in the chain of production in the milling systems in Senegal	Users and beneficiaries were involved with the project resulting in a product that met the needs; Early involvement of the government of Senegal led to promotion of the product; Easy and rapid access to research funds when needed; Support available for commercialization, and wide distribution of results; Potential for greater impact and revenue generation for IDRC if financing available to individuals and groups to acquire the machines and development of technology agreement with SISMAR and CNRA

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
91-1029 Inedible Vegetable Oils	Burkina Faso WARO	Government of Burkina Faso; Female groups; CRIQ (Canada); NGOs (OXFAM, Pag-La-Yiri)	Perfecting of improved extraction and transformation technology for inedible vegetable oils; Technology transfer of oil extraction and transformation technology; Study of the oil market	Horizontal screw press and accessory equipment, and related soap mixes; The characterization and extraction processes of 5 oil bearing plants	Groups and associations of women in rural areas; small family units of extraction and oil transformers
90-1008 Anthocyanic Pigments	Burkina Faso WARO	University of Ouagadougou	An extraction process for dyer's sorghum at the experimental stage; Limited trials of dying of vegetable fibre tile and polished stones for livestock	Perfecting a new laboratory process for extraction of anthocyanides; Scientific papers	Researchers;

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
91-1029 Inedible Vegetable Oils	Burkina Faso WARO	Traditional oil extraction is difficult, slow, with a low return; Presses and accessories permit significant increase in oil production with reduced physical effort and increased revenues to producers; There is a progressive replacement of imported oils	Significant impact for women's groups and the country in general; The additional revenue for women permits improvement in living conditions; Large scale utilization has increased total oil production and production of karité butter and increased value added use of local plants	Financing of pilot operations by the government contributed to success; Development objectives emphasized from the outset; Targeted population needs well understood; Good Canadian partner; Involvement of users and beneficiaries from the outset; Financing available for all stages; Enhanced potential with press improvements and bank credit for women to acquire machines
90-1008 Anthocyanic Pigments	Burkina Faso WARO	Results to date are scientific in nature and laboratory scale extraction; Utilization is experimental	Improvement of skills of the research team	Financing unavailable for implementation of pilot plant or transfer of technology which would have allowed demonstration of results; Project leadership commitment lacking; No industry involvement; Inadequate money management; Potential through involvement of local agri-food industry and more promotion of the technology

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
89-0019 Plantain Conservation	Ivory Coast WARO	University of Abidjan; Farmers	Conception and development of new preservation activities; Field testing and evaluation of new methods; Dissemination of results	New method for preservation of bananas in a rural setting;	Researchers

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
89-0019 Plantain Conservation	Ivory Coast WARO	New method not used or sold due to browning and aftertaste problems as a result of burying; Bananas can be preserved for 2 weeks (previously 4 days) in a rural setting	Although the method works, it is not acceptable as a solution; Technique used only during project period	Cost of the technique too high for farmers; There is a need to have stakeholders such as wholesalers involved from the outset; Not presently feasible to commercialize the results

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
89-1027 Plant Fibre Tiles	Ivory Coast WARO	National Superior School of Public Works (EMSTP); IRC (Canada); BIT Project; Local tile works	Produce inventory of local tile fabrication resources; Perfect fabrication process using a new mix and local materials; Dissemination of results; Development of a local standard	Demonstration that local coconut fibre, rice straw, and grass straw can be used to produce tiles similar to those made from sisal fibre which is imported; New mix developed; Trained people, publications, videos, with technology transfer to tile producers; New equipment developed	Tile producers; Government programs and departments; Dwelling owners; Association of Tile Producers; Stake holders from Benin, Burkina Faso, Chad, Ghana, Ivory Coast

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
89-1027 Plant Fibre Tiles	Ivory Coast WARO	New centre for support and promotion of local enterprises created; New Tile Production Company created; Research Awards won; New use for local materials; Political involvement in dissemination of results with new incentive measures; Import reduction; New employment and revenue generation; New product cost 10% less than competing product	200 dwellings built using the product which is well accepted in the marketplace and has had a considerable influence in the country	The rural population has not benefitted as cost is too high; Problems encountered in installation - poor training of installers

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
91-1001 Traditional Dyes	Guinea WARO	DNRST; CTT (Canada); University of Conakry; Dyers' Cooperative; Government of Guinea; Friedrich Ebert Foundation	Improvement of dying technology and characterization of plants used; Improved procedure of indigo extraction; Production of a range of colours and procedures; Dissemination through workshops and seminars	Publications in Canada and Guinea, conferences; Improved dying procedures, process and equipment; Dyers and local women trained in extraction of indigo; Adoption of new procedures by co-ops	Dyers Co-ops in the interior of the country; Technical people with CEGEP; NGOs (FCIL, FEF, MSVA) USAID; National Department of Craft People

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
91-1001 Traditional Dyes	Guinea WARO	70 women have been trained and use the new technique; Guinean Association of Women Researchers disseminating the new technology; Construction of modern training centre (USAID); Extraction technique developed reduces time required from 180 hours to 30 hours	Revival of interest in traditional indigo dying; Creation of a modern training centre for dissemination of new techniques; Formation of a female group for indigo extraction; Strengthening of Guinean researchers and dyers; Creation of employment; There are thousands of dyers presently distributed throughout the country in need of training and equipment	More involvement of other participants in the textile sector an important omission; Lack of funding for technology transfer activities and marketing; The cost of equipment is high and is a limiting factor - should be produced locally; There is potential for markets in Africa and North America

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
92-0800 Impregnated Bed Nets	Benin WARO	Organization for Solidarity and Development (OSSD); McGill University; UNICEF; Production committee; Female organizing committee (NYONA); Small and medium size enterprises; Villagers; Fashion designer; Health Ministry; WHO; NGOs (OCSO, OCCGDE); National University of Benin; Schools	The development and utilization of mosquito nets impregnated with permethrine (MIP); Establishment of a production unit for MIP; The study of malaria re- attitudes and performance of users and non users; Dissemination of information and production of MIP	Establishment of an MIP production facility; Broad international dissemination of results of MIP and collaborative work; Education of the public at large;	Villagers of Savalou; MIP Production Unit; Health Ministry;

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
92-0800 Impregnated Bed Nets	Benin WARO	Reduction in cases of malaria in the project zone and in the whole region; Emergence of a National Program at the Health Ministry level; Creation of employment and revenue through the production facility; Grant from UNICEF for 1,000,000 CFA to supply raw materials from Thailand; Trained managers; Financial autonomy improved for OSSD; Joint publication re-malaria (IDRC/Royal Bank/OMS) ; Reduction in infant mortality 17% in Ghana, 33% in Kenya with use of nets	Significant in the region, however breakdowns of supply of raw materials a limiting factor	Good project leadership and participation of stakeholders in the process; Dissemination Plan; Cost of the nets has escalated out of reach for a large part of the population; Standards and product quality mixed; Breakdown in cooperation between Canadian partner and local group demonstrates the need for IDRC funds to be paid directly to project executors (project funds presently frozen); IDRC project monitoring and follow up a necessity; Potential - the process is simple and can be manufactured, sold, exported in Benin, Ivory Coast, Togo, Ghana, Burkina Faso, Mali, etc.; There is support for more initiatives from international institutions;

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
88-0215 / 91-0158 Aids Diagnosis	Global	PATH GLOBAL; Rockefeller Foundation; USAID; Local, Regional, and National Governments in developing countries; Local community groups and villagers; For-profit and not-for- profit enterprises; WHO; UNAIDS; Research teams and extension workers	Development of a simple, rapid, accurate AIDS test; Production of prototype kits and testing; Development of inexpensive screening procedures; Transfer of technology to production and marketing units in developing countries	Production and use of the product in selected developing countries; Relationship between PATH and production units in developing countries; A new technology and approach to low cost screening; Academic papers, presentations at workshops, conferences; Technology transfer and training of all groups involved; New evaluation tool for use by health organizations	PATH; Production enterprises (Argentina, India, Indonesia, Thailand, Zimbabwe) (China via USA) Community health programs; Rural people; Government agencies and departments; International organizations

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
88-0215 / 91-0158 Aids Diagnosis	Global	Manufacturing in 6 world regions; Millions of tests conducted each year; Reduction in the cost of testing by 50% (\$3 to \$1.50 per kit); Large multi-national drug companies forced to drastically lower prices for kits	Large number of tests being conducted in 5 regions of the world; Production units established in these areas producing revenue and supporting public health programs; People in these regions are dependent on the government for testing	Second stage funding should have been available when required for technology transfer and scale-up. Impact could have been higher if this was the case. Can be considered the flag-ship project; Marketing inputs are a major part of any project of this nature and a determining factor of success; Many other public health issues and diseases can be addressed using this dipstick technology; Expanded program could use chromatographic test strips

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
93-1013 95-1013 Fish Gene Banking	Global	Vancouver Aquarium, World Fisheries Trust; British Columbia First Nations Bands; International Organizations - Colombia, Venezuela, Thailand, Philippines (Government Orgs. And Indigenous peoples) Canadian Federal and Provincial Government Departments; Small fish farms; Large resource companies ; NGOs; Academics;	Development of technique for conservation and use of wild fish genetic resources; Training of First Nations people in techniques and processes; Field testing and establishment of working groups; Establishment of science network; Establishing wild fish gene banks	Technology developed for field cryo-preservation of sperm from a variety of economically important warm water species and Pacific salmon; Software developed for managing, keeping track of, and holdings in regional gene banks, and standards; Training programs and manuals; New international science network; Policy framework; Trained First Nations field workers; Publications, workshops, conferences; Extension services; Feasibility study; Use of technology by for- profit and not-for-profit companies	First Nations people; Federal and Provincial Government Departments; Canadian NGOs; Large resource companies; Small Fish Farmers; International Organizations (FAO); Vancouver Aquarium; International organizations and universities (Colombia, Venezuela, Philippines, Brazil); Indigenous peoples and governments from developing countries

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
93-1013 95-1013 Fish Gene Banking	Global	<p>Trained First Nations People in B.C., in use of the technology in the process of training others as required;</p> <p>Extensive use of technology by large and small business, NGOs both inside and outside of Canada in developing nations;</p> <p>Software system available for use and/or licensing as required;</p> <p>Complete training package for replication of results;</p> <p>International science network in place (WFT, ICLARM, FAO, IPGRI)</p>	<p>Results of the projects are being used locally and internationally in developing countries;</p> <p>Formation of the research network places Canada at the forefront of this technology</p>	<p>The impact to date could have been much greater had there been more emphasis on technology transfer and replication;</p> <p>The potential for this technology is enormous based on the recent major declines of world fish stocks and the need to implement conservation measures and associated management systems</p>

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
90-1019 / 92-1452 Wood Adhesives	Tanzania EARO	TIRDO; ForinTek (Canada); Tanzanian Forest Research Institute; Private local company; Tembo; Villagers; Wood panel producer; Users of products	Adhesives and coating formulations developed and tested; Industry trials performed; Some technology transfer to date	Installed mill capability using tannin adhesive; Product that is structurally sound with water and rot resistance with lower cost of production; Feasibility study and marketing survey; New prototype process; Research network in place; Training, publications and presentations at workshops;	Producers of tannin and cashew nuts; Plywood panel producers; Consumers and users of products; Researchers at TIRDO
90-0278 Schistosomiasis Intervention Trial with a Botanical Molluscicide	Zimbabwe ROSA	Blair Research Lab; Ministry of Health; WHO; OECD; UN; 2 Community groups; DNIDO; JICO	Design of and implementation of an experiment conducted on two community groups	None that can be determined at this time; Some reporting of results in 1996 Blair Annual Report	Possibly some research staff

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
90-1019 / 92-1452 Wood Adhesives	Tanzania EARO	Cost advantage of 20% for input costs, but increased relative complexity of mixing and feed system; New products produced but not presently in production	Although production trials and test products have been produced, the mill has reverted back to using urea-formaldehyde adhesive	Strong industrial partner required; Good technology available with the right partner, with the right partner there may be opportunity
90-0278 Schistosomiasis Intervention Trial with a Botanical Molluscicide	Zimbabwe ROSA	None that can be identified	New funding at Blair from DNIDO and JIDA for schistosomiasis research was possibly in part due to this project; The project can be considered a failed project.	The lead research group appears to have no interest in producing results for this project;

Table 2 - A Listing of Project Outcomes cont.

Project	Country/Region	Reach	Activity	Outputs	Users/Beneficiaries
91-1051 Rural Cottage Tanneries	Zimbabwe ROSA	University of Zimbabwe; Techno-Tan (Canada); Zimtrust (Local); Agritex (Local); Women's Bureau (Local Villagers; Farmers	Development of tanning procedures; Piloting and creation of rural tanneries	Training and workshops; Rural tanning process developed; Tanneries created; Upgrading of skills by crafts people; Dissemination of results;	Rural women and families; Farmers and villagers; Local development groups; Women's Bureau, Zim Trust

Table 2 - B Listing of Project Outcomes cont.

Project	Country/Region	Results	Impacts	Lessons Learned / Potential
91-1051 Rural Cottage Tanneries	Zimbabwe ROSA	3 small tanneries created using local skins; 155 people trained; New networks established	New for-profit entities created; New economic and social development activities; Technical expertise improved in a local setting	Potential for female empowerment and income generation with associated public relations benefits