

H. EVALUATION ABSTRACT (do not exceed the space provided)

The amended MART Project seeks to strengthen Pakistan's agricultural research system by (1) ensuring its responsiveness to the needs of farmers and agribusiness; (2) development of relevant technology; and (3) dissemination of research technology through marketable products by the private sector. Pakistan's national agricultural research system is an open federation of national and state institutions. Agricultural research organizations and universities in each of the four provinces are independent of direct federal control. The autonomous Pakistan Agricultural Research Council (PARC) is the central coordinator of agricultural research policies, programs and budgets.

The objective of this second evaluation, undertaken in year 9 of a 10 year project life, was to (1) assess progress toward attaining the project purpose; (2) develop guidelines for increasing project effectiveness within the remaining 18 months of the project life; and, of highest priority, (3) address sustainability issues of agricultural research after the Project PACD. The methodology used was primarily qualitative in nature, drawing on the informed opinion of research administrators, scientists, and clients obtained in interviews and visits to PARC, the nine collaborating research institutions, farming systems research and agribusiness target sites.

The Evaluation Team concluded that Pakistan's agricultural research system is established, operating, and producing useful research. Tensions within the system, caused by its federated nature, have been exacerbated by budgetary obstacles as each part seeks to maintain and improve itself. MART's major achievements have thus centered around technological, rather than managerial, improvements. However, the Government of Pakistan has recently moved rapidly to assure increased funding, focusing the increase on selected activities to improve research productivity, and has liberated scientific creativity by delegation of management responsibility to program leaders. World Bank funding of agricultural research through ARP-II assures continuing foreign exchange for training, technical assistance, and commodities. The agricultural research system, while not perfect, will be sustained and improved.

A single recommendation to USAID requests attention to innovative means for facilitating continued U.S.-Pakistan interaction in science and education following withdrawal of the Mission. Eleven recommendations to the Pakistan Agricultural Research Council reflect the principal concerns with which PARC will have to struggle in the years ahead and center on critical elements of sustainability.

1. EVALUATION COSTS

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IQC:PDC-1406-I-00-
0033-00

\$ 54,989

MART Project

2. Mission/Office Professional
Staff Person-Days (estimate) 20

3. Borrower/Grantee Professional
Staff Person-Days (estimate) 35

ABSTRACT

COSTS

A.I.D. EVALUATION SUMMARY PART II

J. SUMMARY OF EVALUATION FINDINGS CONCLUSIONS AND RECOMMENDATIONS (Try not to exceed the 3 pages provided, Address the following items:

- Purpose of activity(ies) evaluated
- Purpose of evaluation and Methodology used
- Findings and conclusions (relate to questions)
- Principal recommendations
- Lessons learned

Mission or Office: USAID/Pakistan

Date this summary prepared: June 1993

Title and Date of Full Evaluation Report: Pakistan Management of Agricultural Research and Technology Project.

1. **Purpose of the MART Project:** The purpose of the MART project, as amended in June 1990, is (a) to develop and disseminate improved technology and information through key research institutions; and, (b) to foster a collaborative relationship whereby research institutes serve private agribusinesses and farmers and use the private sector to disseminate marketable, improved technologies. The Pressler Amendment enforced in 1991 resulted in a cut of \$5 million in project funding which significantly affected the activities related to research-industry collaboration, the focus of the amended project.

2. **Purpose of the Evaluation and Methodology Used:** This second interim evaluation focused primarily on management aspects of the amended MART Project and Pakistan's agricultural research system. Major issues to be examined were: progress towards attaining the project purpose; contributions and effectiveness of the key players in the institutionalization of programs and linkages to provide long-term sustainability to Project elements; current paradigm that embodies the objectives and methodologies associated with GOP/USAID approach to the Project; and research capacity that the Project will leave behind for continued and enhanced performance of the agricultural research system. Since no USAID-funded follow on activities are planned, a high priority was placed on identifying and assessing sustainability issues.

The methodology used by the Evaluation Team was primarily qualitative, drawing on the informed opinion of research administrators, scientists, and clients obtained in interviews throughout the system. The Team was also able to draw on detailed information prepared for this evaluation by the GOP MART Project Secretary, as well as, on the 1989 mid-term evaluation in which two of the team members had participated. Team members visited PARC and each of the nine collaborating research institutions. Scientists and administrators were interviewed at each site. Team members also visited laboratories, experimental plots and agribusiness target sites. USAID, PARC and contractors provided briefings, documents and other literature, as well as summary information about project progress.

3. **Findings and Conclusions**

The basic structure of the Pakistan agricultural research system is well-established and productive. It consists of four provincial research institutes, three provincial universities, a national center (NARC) and at least one outlying federal institute (AZRI), plus a large number of outlying subcenter, field stations, and experimental farms, coordinated by a national research council (PARC). The system is well staffed, but there are major disparities in capacity among the various organizations.

The centerpiece of the MART project is management, yet management of research received far less attention than technological aspects. Perhaps this was owing to major constraints about which MART could do little, including traditional administrative practices and the static budget with its growing disparity between establishment costs and operating funds. These constraints are now being resolved, first by a larger budget that expands the establishment/operations ratio, and second, by decentralizing responsibility and authority over operating funds to the research program directors.

Major Accomplishments

Major MART accomplishments include a massive institutional strengthening effort which trained more than 80 scientists and educators to the Ph.D. or M.Sc. levels and provided non-degree specialization to almost 200 scientists and administrators. MART funded in-country training of almost 5000 persons in 141 short courses.

Laboratories throughout the system were upgraded with equipment and computers, and PARC and NARC accounting systems were computerized. Technical assistance from CIMMYT, ICARDA, Winrock International, and BOSTID introduced research strategic planning and management methods and hands-on training.

Besides this more general institutional support, MART introduced innovative concepts, installed as coordinated federal:provincial pilot activities, to support research. The following are among the most important of these efforts.

- **Library technology:** 17 libraries provided with CD ROM readers and data bases, as well as microfiche back files of scientific publications, with readers and printers, and photocopiers
- **Communication cells:** five provincial agricultural communications support cells equipped and operating, backed by NARC's central audio-visual communications unit.
- **Training institute:** a central unit established, equipped and operating, with a significant track record in training staff throughout the system.
- **Farming Systems Research:** A national FSR coordinating office and four provincial units in operation.
- **Agribusiness relations:** A recently established national agribusiness relations cell is facilitating joint research-agribusiness partnerships.
- **LEMUR:** A laboratory equipment maintenance and repair unit is in operation and equipped.
- **Competitive research grants:** This BOSTID-managed effort allocates resources competitively at the margin to the best scientific endeavors, provides superior mentors on how to do science, rewards innovations and stimulates excellence, while improving international scientific linkages.

Sustainability of the Agricultural Research System

The Pakistan agricultural research system is established, operating and producing useful research. The GOP has not only accepted responsibility for maintenance of the agricultural system, but has endeavored to strengthen it. The GOP has moved rapidly to assure increased funding, focusing the increase on selected activities to increase research productivity, and has liberated scientific creativity by delegation of management responsibility to program leaders. The GOP has increased 1992-93 funding for agricultural research at the federal level by 180 percent and has also created interim funding for the same year under the Productivity Enhancement Program (PEP). PEP supplements support for agricultural research on a competitive basis, which should not only improve scientific productivity, but stimulate creativity and reward initiative. Furthermore, World Bank funding of research assures continuing foreign exchange for training, technical assistance, and commodities. The Team concluded that the agricultural research system, while not perfect, will be sustained and improved.

4. Principal Recommendations

Noting that USAID had in place a well thought out plan for program phase out which will continue ongoing activities with primary attention to strategic planning and agribusiness relations, the evaluation team has a single recommendation to USAID:

Identify and promote innovative ways in which international scientific linkages -- particularly among Pakistani and U.S. scientists, educators, and businesses -- can be fostered and sustained in the post mission period.

Other recommendations were directed to PARC (and other entities where noted) and reflect the principal concerns that the system will have to struggle in the years ahead. They reflect critical elements of sustainability: maintaining the integrity of the agricultural research system; assuring adequate amounts of appropriate resources; providing for continuity and refinement of concepts; encouraging responsiveness to client needs; and, most significant, encouraging scientific excellence throughout the system. Principal recommendations include:

- (a) Review the research planning process and ascertain what, if any, steps or procedures were overlooked in the planning process at either the federal or provincial level and take corrective action.

(b) Review of the **NARC Master Plan** by PARC, NARC, and selected scientists from provincial institutions to assure optimization of resource use and complementarity between NARC and the provincial institutions and to consider adding a section on monitoring and evaluation to the Master Plan.

(c) Increase **research-extension collaboration** throughout the process of problem identification, research planning, verification of research results, and dissemination.

(d) Appraise the **Farming Systems Research program**, particularly the questions of necessity and sustainability.

(e) Resolve the issue of the geographic mandate of **AZRI** with careful attention to the limited human and financial resources currently available to support research work at the substations; continue the very productive relationship between AZRI and ICARDA for the foreseeable future.

(f) Increase effort to gain support from and cooperate with the **private sector**; direct effort at a higher level than the case to date to see if significant involvement and support can be achieved during the balance of the project.

(g) Increase efforts (through donor assistance, bilateral agreements, and direct contract with scientists and institutions) to establish lasting and meaningful **international linkages** with universities in developed countries to promote scientific exchange and specialized postgraduate training.

(h) Take a more active role in documenting productive research and presenting it in well-illustrative form to policy makers and the general public, as well as donors, to help assure **continued and increased financial support** in the future.

(i) Withdraw all unused equipment, repair what is possible and reassign it to those who are able to use it and survey that which is unusable and get it off the books.

(j) Improve the quality of the communication products by providing additional training for provincial agricultural communication support cell staff in script writing, editing, production and quality control in the NARC audio-visual unit.

(h) Concerning the question of continuance of selected project elements, pilot activities sponsored by MART which are still at an early stage of development will have to be carefully nurtured and their utility evaluated against their contribution before expansion or retention can be determined.

5. Lessons Learned

The most significant lessons learned have to do with improving the realism of program expectations relative to resource, time, and political constraints. These are:

(a) Improved management within a highly structured system is generally improved at the margin when additional resources reward better planning, execution and implementation of research. This requires liberation of the creative energy of scientists, with appropriate recognition and resources for innovation and excellence. There is encouraging evidence that PARC's top management is committed to such a course, but the concept has not yet prevailed throughout the system.

(b) The difficulty of effecting changes in the management of a large research program conducted by geographically dispersed entities in a federated system, while recognized, was inadequately addressed. PARC's role is primarily coordinative and supportive; it does not command. This requires development of consensus in a system where participants are accustomed to seeing resource allocation as a zero-sum game.

(c) The critical nature of time lags become apparent when a long term program nears completion with little probability of being extended. Half of the long term participants will not return to the project in time to contribute to its purpose during LOP. The last tranche of commodities, while invaluable for future productivity, will not materially impact research output in the next year. The benefits of these and other MART contributions will continue to permeate the research system, so their impact is not lost, just delayed.

K. ATTACHMENTS (List attachments submitted with this Evaluation Summary; always attach copy of full evaluation report, even if one was submitted earlier)

Second Mid-term Evaluation Report, March, 1993.

L. COMMENTS BY MISSION, AID/W OFFICE AND BORROWER/GRANTEE

The Evaluation Team was comprised of members with extensive experience in international agriculture, institutional development and technology transfer. The Team closely followed the assigned scope of work for this evaluation. Two of the team members had earlier evaluated this project in 1989. This enabled the team to ascertain progress of the Project over the last 4 years.

The Team has made highly practical recommendations especially in view of the completion of the MART Project in August 1994 and Mission close-out. These recommendations aim at bringing sustainability to agricultural research efforts of Pakistan through better planning, international scientific linkages, research-extension-industry collaboration and effective use of facilities created under the Project.

Most of the recommendations made by the team are addressed to the Pakistan Agricultural Research Council (PARC), the GOP counterpart of the MART Project. PARC fully concurs with these recommendations and is in the process of developing a strategy for their implementation. It is anticipated that this evaluation report will not only direct the MART Project to a logical conclusion but will also serve as a guidebook in research planning, management and evaluation for Pakistan's agricultural research system.

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**PAKISTAN MANAGEMENT OF AGRICULTURAL RESEARCH
AND TECHNOLOGY PROJECT**

Contract No. PDC-1406-I-00-0033-00

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SECOND MIDTERM EVALUATION

FINAL DRAFT

Prepared for:

USAID/Pakistan

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March 1993

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We are also grateful to the leadership and staff of the provincial institutions of the Pakistan Agricultural Research System who freely gave their time and wisdom to orient us to the problems and potential of their challenging work.

As scientists, you are involved in the search for knowledge and its application through education to improve agriculture's contribution to the well-being of mankind. We are confident that your efforts will be crowned by excellence.

LIST OF ACRONYMS

AARI	Ayub Agricultural Research Institute, Faisalbad, Punjab
ACE	Agricultural Commodities and Equipment project
AERU	Agricultural Economic Research Unit
ARDO	Agricultural and Rural Development Office
ARI	Provincial Agricultural Research Institute
ARI/Sariab	Agricultural Research Institute, Sariab, Baluchistan
ARI/Tandojam	Agricultural Research Institute, Tandojam, Sindh
ARI/Tarnab	Agricultural Research Institute, Tarnab, NWFP
ARP	USAID Agricultural Research project, 1969-1984
ARP-I	World Bank First Agricultural Research project
ARP-II	World Bank Second Agricultural Research project
AVC	Directorate of Audiovisual Communications
AZRI	Arid Zone Research Institute, Baluchistan
BARD	Barani Area Rural Development Program, CIDA
BOSTID	Board of Science and Technology for International Development
CGIAR	Consultative Group on International Agricultural Research, Washington, D.C.
CIMMYT	International Wheat and Maize Improvement Center, Mexico
COP	Chief of Party
CPs	Conditions precedent to disbursement
CRSP	Collaborative Research Support Program
DD	Deputy director
DG	Director general
FSR	Farming systems research
GDP	Gross domestic product
GOP	Government of Pakistan
ICARDA	International Center for Agricultural Research in Dry Areas, Syria
LEMRU	Laboratory Equipment Maintenance and Repair Unit
LOP	Life of project
LT	Long-term
MART	Management of Agricultural Research and Technology project, USAID
NARC	National Agricultural Research Center
NILTA	National and International Liaison Training and Technical Assistance
NWFP	North West Frontier Province
PACD	Project assistance completion date
PACSC	Provincial Agricultural Communication Support Cell
PARC	Pakistan Agricultural Research Council
PEP	Productivity Enhancement Programme
PIL	Project implementation letter
PITC	Provincial Information Transfer Committee
PP	Project Paper

ProAg	Project Agreement
Rs	Rupees, Pakistani monetary unit (Rs25 = US\$1.00)
SAU	Sindh Agricultural University
ST	Short-term
TA	Technical assistance
TITC	Technical Information Transfer Committee
TIPAN	Transformation and Integration of the Provincial Agricultural Network project, USAID
TOEFL	Test of English as a Foreign Language
USAID	Agency for International Development
WB	World Bank
WID	Women in development

EXECUTIVE SUMMARY

A. Background

U.S. assistance to Pakistan's agricultural research system has been continuous since 1969. The Management of Agricultural Research and Technology project (MART) was designed to build on prior USAID experience and complement a World Bank effort of similar intent. Together, USAID's MART and the WB's ARP-I enabled the Pakistan Agricultural Research Council (PARC) to establish the National Agricultural Research Center (NARC) and the Arid Zone Research Institute (AZRI) and to strengthen provincial agricultural research institutes and universities.

The original MART strategy sought to strengthen the performance of agricultural research organizations through five components: research management and administration; information transfer; training for the agricultural research network; arid zone research; and wheat and maize coordinated programs. The 1989 midterm evaluation found that this ambitious goal would not be met because of its broad scope and the fact that many management problems were not amenable to project inputs.

The 1990 amendment which extended MART's PACD to August 7, 1994, with additional funding, concentrated the program on ensuring research responsiveness, developing relevant technology, and disseminating research technology, directed at strengthening nine key universities and research institutes. The intent was to focus on agricultural research priorities as defined by businessmen and farmers, and the subcomponents were designed to facilitate this interaction.

The Pressler Amendment was activated in Pakistan in December 1991, preventing release of the last tranche planned for the project, but not affecting the PACD. All efforts since have been directed at orderly completion of the project. Virtually all available funds have been earmarked, and project supervision and TA are scanty and diminishing. The recommendations of this evaluation therefore focus on ensuring the sustainability of progress made during MART.

B. Purpose of Evaluation and Methodology Used

This second midterm evaluation will probably be the final evaluation of the MART project. As such, it focused on the consolidation of the amended MART project following the first midterm evaluation in 1989. It also projects the probable sustainability, within GOP support levels, of the research program which MART supports following withdrawal of U.S. assistance as required by application of the Pressler amendment.

The methodology was primarily qualitative, drawing on the informed opinion of research administrators, scientists, and clients (see Annex B) obtained in interviews

throughout the system. We were also able to draw on detailed information prepared for this evaluation by the MART Project Secretary and others, as well as on the 1989 midterm evaluation. Two of the three team members participated in that evaluation.

Team members visited PARC and each of the nine collaborating research institutions. At each site, we interviewed administrators and scientists. We visited laboratories, experimental plots, and farming systems research (FSR) and agribusiness target sites. USAID, PARC, and contractors provided briefings, documents and other literature, as well as summary information about project progress.

This evaluation report summarizes and evaluates the amount and quality of TA, training, commodities, and other inputs provided by MART. Pressler reduced the project's authorization by \$5 million (13 percent), but the impact of this shortfall was minimal on overall performance because of astute redistribution among categories. With the exception of some laboratory and field equipment, and some short-term management training, the quality of inputs was superior.

C. Findings and Conclusions

C1. Pakistan Agricultural Research System

Pakistan's national agricultural research system, which MART seeks to strengthen, is an open federation of national and state institutions not unlike that in the United States. Agricultural research organizations and universities in each of the four provinces are independent of direct federal control. The autonomous Pakistan Agricultural Research Council central coordinator of agricultural research policies, programs, and budgets—PARC—is to undertake, aid, promote, and coordinate agricultural research.

The basic structure of PARC is well-established and productive. It consists of four provincial research institutes, three provincial universities, a national center (NARC), the Arid Zone Research Institute (AZRI), plus a large number of outlying subcenters, field stations, and experimental farms coordinated by a national research council (PARC). The system is well-staffed with 4015 professionals, including 460 with doctorates and 2851 with master's degrees, but there are major disparities in capacity among the various organizations.

Tensions within the system, caused by its federated nature, have been exacerbated by budgetary obstacles as each part seeks to maintain and improve itself. Scientists identify their major constraints as lack of operating funds and the torpidity of administrative procedures. PARC has a variety of coordinating and support devices to facilitate collaboration within the system. The recently established Productivity Enhancement Programme (PEP) provides a mechanism to support priority research activities by allocating additional funds to these programs at the margin.

This scientific establishment has generated some excellent technology, particularly in disease-resistant and productive varieties of major crops. A core of extraordinary specialists in a few key disciplines is supported by competent scientists in virtually all subjects.

However, a closer relationship with farmers and agribusiness would keep them better informed about the constraints, parameters, and opportunities perceived by their clients.

C2. The MART Project

Management of agricultural research continues to be a major concern, and we noticed little improvement—perhaps due to major problems which MART can do little about, including ponder some administration and the growing disparity between establishment costs and operating funds. These constraints are now being addressed, first by a larger budget that expands the establishment/operations ratio, and second, by decentralizing responsibility and authority over operating funds to research program directors.

C2a. Accomplishments

Major MART accomplishments include a massive institutional strengthening effort that trained more than 80 Pakistani scientists and educators to the Ph.D. or M.Sc. levels and provided non-degree specialization to almost 200 scientists and administrators. MART funded in-country training of almost 5,000 persons in 141 short courses.

Laboratories throughout the system were upgraded with equipment and computers, and PARC and NARC accounting systems were computerized. Technical assistance from CIMMYT, ICARDA, Winrock International, and BOSTID introduced strategic research planning and management methods and hands-on collaboration.

Besides these efforts, MART introduced innovative concepts—coordinated federal and provincial pilot activities—to support research. Among the most important:

- **Library technology.** Seventeen libraries provided with CD-ROM readers and databases, as well as microfiche back files of scientific publications, with readers and printers, and photocopiers.
- **Communication cells.** Five provincial communications support cells equipped and operating, with a central audiovisual communications unit at NARC.
- **Training institute.** A central unit established, equipped, and operating with a significant track record in training staff throughout the system.
- **Farming systems research.** A national FSR coordinating office and four provincial units in operation.
- **Agribusiness relations.** A recently established national agribusiness relations cell is facilitating joint research-agribusiness partnerships.
- **LEMUR.** A laboratory equipment maintenance and repair unit is in operation.

- **Competitive research grants.** This BOSTID-managed effort allocates resources competitively; provides superior mentors on how to do science; stimulates excellence; and improves international scientific linkages.

C2b. Sustainability

The GOP has not only accepted responsibility for maintenance of the agricultural research system, but has moved to strengthen it. The federated system, while imperfect, is established, operating, and producing useful results. Moreover, it is financially sustainable. The GOP has raised Rs 569 million for agricultural research at federal level for 1992/1993, an increase of more than 180 percent over the Rs 203 million average of the prior two fiscal years. The GOP has also created an interim funding of Rs 200 million for agricultural research for the year 1992/93 under the Productivity Enhancement Programme (PEP).

The World Bank's Second Agricultural Research project (ARP-II) provides much the same type of foreign exchange support (training, TA, commodities, construction) as MART, and at a higher level, so Pakistan will not be hampered by the cessation of U.S. assistance.

The GOP has initiated the Productivity Enhancement Programme (PEP) as a way to increase operating funds for high priority projects. It supplements support on a competitive basis, which should not only improve scientific productivity, but stimulate creativity and reward initiative. Finally, the chairman has delegated management of research operating funds to the program leaders. This freedom places responsibility for performance with the scientist, where it belongs.

D. Recommendations

The USAID project officer has a well thought-out plan for phasing out the MART project, to which most remaining funds are committed, that will continue ongoing activities with primary attention to strategic planning and agribusiness relations. The evaluation team therefore has a single recommendation for USAID.

- Identify and promote innovative ways in which international scientific linkages—particularly among Pakistani and U.S. scientists, educators, and businesses—can be fostered and sustained in the post-mission period.

Opportunities exist for international scientific linkages that require minimum funding to pay large dividends. USAID funds for such programs will not be forthcoming unless the Islamabad mission justifies the need and persists in its advocacy.

All other recommendations are directed at PARC, reflecting the concerns that the system will have to struggle with in the years ahead.

Research planning. PARC should review the planning process and ascertain what steps were overlooked at the federal or provincial level and take corrective action, if required.

NARC master plan. PARC, NARC, and selected scientists from provincial institutions should again review the master plan to assure optimizing resources use and complementarity between NARC and the provincial institutions, and to consider adding a section on monitoring and evaluation to the plan.

Research-extension collaboration. We recommend that research and extension have a greater interface throughout the process of problem identification, research planning, verification of research results, and dissemination.

Farming systems program. PARC and leaders of provincial institutions should carefully appraise the program and determine whether it is necessary.

Private sector relationships. The team recommends more intense effort directed at a higher level to see if significant involvement and support can be achieved during the balance of the project.

Maintaining international linkages. PARC needs to explore many different avenues through donor assistance, bilateral agreements, and direct contact with scientists and institutions to further develop and maintain these scientific linkages.

Equipment and facilities. PARC should withdraw all unused equipment, repair what is possible, reassign it to those who can use it, and get unusable equipment off the books.

Information transfer. Additional training in script writing, editing, production, and quality control in the NARC AVC unit is recommended to upgrade its products.

Continuance of selected project elements. Pilot activities sponsored by MART still at an early stage of development must be carefully nurtured and their utility evaluated before expansion or retention can be determined.

In our judgment, the most critical elements of sustainability in the MART project involve keeping library technology up to date, continuing emphasis on training, encouraging joint research-agribusiness partnerships, and properly maintaining laboratory equipment.

SECTION I

BACKGROUND

SECTION I BACKGROUND

A. Project Description and History

A1. The Pakistan Agricultural Research System

Pakistan is a federation of provinces with significant constitutional responsibilities and authorities, including those for agriculture. The national agricultural research system is an open alliance of national and state institutions not unlike that in the United States. The Pakistan Agricultural Research Council (PARC), which was reconstituted as an autonomous federal body in 1978, has become the central coordinator of agricultural research policies, programs, and budgets. Its purpose is to undertake, aid, promote, and coordinate agricultural research. This vital role must be exercised by leadership since the agricultural research organizations and universities in each of the four provinces are independent of direct federal control.

PARC has a close relationship with the National Agricultural Research Center (NARC). Although NARC has its own management board and research committee, it is under the administrative, technical, and financial control of PARC, as is the Arid Zone Research Institute (AZRI). However, the bulk of Pakistan's research and education infrastructure and staff are within the provincial structures, together with the agricultural extension service.

A2. Background of U.S. Assistance to Pakistan Agricultural Research

U.S. assistance to Pakistan's agricultural research system began in 1969. The Agricultural Research project continued for 16 years, ending in 1985—the same year in which major MART implementation began. This assistance saw the creation of PARC in the mid-1970s and its reconstitution as an autonomous body in 1978. It provided support for PARC and for the initiation of NARC. In 1984, the World Bank's Agricultural Research project (ARP-I) came on stream: a \$24 million project that provided funds to construct PARC headquarters and the NARC institutes of animal husbandry and farm machinery, a sizeable amount of international training, and \$5 million for contract research in the provinces. MART, which was authorized in 1984 but began operations in 1985, was designed to build on prior USAID experience and complement the World Bank effort.

The strategy of the original MART project paper was to increase agricultural production by strengthening the performance of agricultural research organizations through five components: research management and administration; information transfer; training for the agricultural research network; arid zone research; and wheat and maize coordinated programs. An external evaluation conducted in 1989 found that the project provided necessary and desired support to the national agricultural research system; however, the

ambitious purpose was unlikely to be achieved without substantial reduction in scope and modification. The original project was an insufficient response to many of the critical problems because of their intractability and the broad scope of MART's original purpose.

A3. The Amended MART Project

The MART project was amended in June 1990 and the amendment authorized additional funding and extended the PACD to August 7, 1994. The amended project met the criticism implied in the 1989 evaluation by concentrating on nine key institutions (three provincial agricultural universities, four provincial agricultural research institutes, and the National Agricultural Research Center), and the Arid Zone Research Institute. The program of work with these institutions was to be focused on ensuring research responsiveness, developing relevant technology, and disseminating research technology. The intent was to focus on agricultural research priorities defined by businessmen and farmers, and MART's subcomponents have been designed to facilitate this interaction.

A3a. Ensuring Research Responsiveness

Private Sector Contribution to Planning. The new project design contemplates continued emphasis on the master plans of NARC and AZRI and development of additional master plans for provincial organizations. Agribusiness leaders will contribute their input to these plans through periodic seminars where they can express their needs.

In addition, PARC is formalizing its Agribusiness Committee into an Agribusiness Initiatives and Relations Cell. The farming systems research activity will be continued as a means for feedback of farmers needs into the research system.

Research Prioritization and Master Plan Implementation. This element provides assistance in the prioritization and project budgeting of elements of the master plans, computerization of NARC's accounting system, and continued assistance in management improvement.

Enhancing Researchers' Understanding of Private Sector Needs. A re-entry program for linking recent overseas graduates into the national research system (and particularly with agribusiness) will be developed under this element.

Public Sector Incentives for Responsiveness to the Private Sector. This activity seeks to recognize, in annual personnel evaluations, a scientist's linkage with the private sector. It legitimizes personal financial rewards through research grants that involve the private sector, and retention of honoraria up to an equivalent of 10 percent of salary received for cooperation with the private sector.

A3b. Technology Development

The purpose of this component is to enhance research institutes' abilities to respond to client demand by supporting applied research in specific areas to generate technologies relevant to private sector needs.

Farming Systems Research. The FSR program will promote the commercialization of proven techniques through the development and test marketing of products generated from research.

Arid Zone Research. Project funds support arid zone research by AZRI on farmers' fields in all four provinces. This work emphasizes livestock and range management, as well as crop production on non-irrigated land.

Economics and Social Science Program. The objective of this activity is to institutionalize the nascent social science program by helping the PARC social sciences division broaden and strengthen PARC-supported Agricultural Economic Research Units (AERUs) at NARC and in each of the four provinces, through support of economic research that extends to commercialization.

Research Grants Program. This operation uses the Board of Science and Technology for International Development (BOSTID) of the U.S. National Academy of Sciences to administer and guide a program of competitive agricultural research grants.

A3c. Dissemination

This component focuses on the development, management, and direct dissemination of research information through multimedia information models. The dual objectives are to transfer technology to users and support science with key reference materials, including microfiche volumes of scientific journals, and current machine-readable agricultural databases on CD-ROM.

Private Sector Dissemination. This activity focuses on involving agribusiness in the commercialization of agricultural technology, particularly that embedded in seed and planting stock, agrichemicals, pharmaceutical products, and farm machinery.

Audiovisual Production. This activity will be concentrated in the NARC center and Provincial Agricultural Communications Support Cells (PACSCs) to produce information packages based on validated research results.

National Network of Agricultural Communicators. This activity supports a national Technical Information Transfer Committee (TITC) composed of leading agricultural communicators from private organizations and provincial and federal institutions.

A4. Planned Cessation of U.S. Assistance to Pakistan

The Pressler Amendment was activated in Pakistan in December 1991 and this action prevented release of the last \$5 million planned for the project, but did not affect the PACD. All efforts since Pressler have been directed at completing the project in an orderly manner. However, the fact that no follow-up activities to the current program can be contemplated has inevitably led to a diminution of activity as staff is phased out and not replaced.

Virtually all available funds have been earmarked and most have been committed. The USAID project officer is on split assignment with USAID/Philippines, and will depart within months, to be replaced by his highly regarded deputy who will not be replaced. A single long-term advisor provided by the primary contractor remains in country. The recommendations from this evaluation must therefore be focused not on reprogramming, but on actions that might be taken by PARC and USAID to lay the groundwork to sustain the progress made during MART.

B. Purpose of the Evaluation and Methodology Used

This second midterm evaluation will probably be the final evaluation of the MART project. As such, it focused on the consolidation of the amended MART project following the first midterm evaluation in 1989. It also projects the probable sustainability, within GOP support levels, of the research program which MART supports following withdrawal of U.S. assistance as required by application of the Pressler amendment.

The methodology was primarily qualitative, drawing on the informed opinion of research administrators, scientists, and clients (see Annex B) obtained in interviews throughout the system. We were also able to draw on detailed information prepared for this evaluation by the MART Project Secretary and others, as well as on the 1989 midterm evaluation. Two of the three team members participated in that evaluation.

Team members visited PARC and each of the nine collaborating research institutions, as well as agricultural secretariats of the provincial government:

- Pakistan Agricultural Research Council (PARC)
- National Agricultural Research Center (NARC)
- Arid Zone Research Institute (AZRI)
- Agricultural Research Institute, Sariab (ARI/Sariab)
- University of Agriculture, Faisalabad (UAF)
- Ayub Agricultural Research Institute (AARI)
- NWFP Agricultural University, Peshawar
- Agricultural Research Institute, Tarnab (ARI/Tarnab)
- Sindh Agricultural University (SAU)
- Agricultural Research Institute, Tandojam (ARI/Tandojam)

At each site, we sought to obtain personal views pertinent to the evaluation from vice chancellors, deans, and faculty of the universities; directors general and scientific staff of the

research institutes; the secretary and/or DG agriculture and planning officer; as well as technical advisors provided under MART. We visited laboratories, experimental plots, and target sites of the FSR program, accompanied by research staff, and sometimes meeting farmers or agribusinessmen. Annex B provides a list of persons consulted.

USAID and PARC provided briefings, documents and other literature, and summary information about project progress. Contract COPs and technical advisors and interviews with PARC members and project officers provided additional information, interpretations, and insights. All of this material helped us form judgments and draw conclusions about the progress, status, and accomplishments of the MART project and the sustainability of its objectives.

SECTION II

SUMMARY OF OBSERVATIONS

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SECTION II SUMMARY OF OBSERVATIONS

A. Participating Research Institutions

A1. Research Planning

Planning for agricultural research is essential at all levels of the national research system. Through execution of such a plan, a nation and its respective research divisions can allocate and efficiently use scarce human, financial, and physical resources.

This process requires an understanding of national and agricultural development and research policy. Research plans should set broad guidelines for work on commodities or sectors identified in the national agricultural plan. Scientists must participate in the formulation of this plan and all scientists carrying out the plan must understand it and be committed to its objectives, priorities, and implementation process.

A national agricultural research plan will develop research objectives and a strategy for attaining them. It will also define priorities, resource requirements, time frame, monitoring and evaluation methods, and a regular process for revision and updating in response to changing conditions. No plan should be final except within a specified period.

Once the national plan is completed and approved, the provincial, institutional, commodity, institute, station, or departmental levels can develop their own. Agricultural research plans at these levels must clearly reflect broad national priorities and policies but are much more specific than the national plan, incorporating their own priority concerns. Orientation toward problem-solving highlight the commodity or institute plans and emphasize the reality of the present state of knowledge, resources availability (human, financial, and physical), level of agriculture, gap between research results and yields, objectives, and monitoring and evaluation procedures.

A research plan is not a work plan, but a guide. Even at the institute or commodity level, it lays out goals for a number of years. An implementation or action plan should be developed around it at the actual research level, setting forth annual work plans and budgets. The research plan keeps research focused on national and regional objectives while the research implementation plan sets the parameters against which progress in problem solving can be measured.

It was evident during this review that the state of planning varies greatly among organizations of the national agricultural research network. This situation reflects level of commitment and capability, both of which also vary with the availability of capable staff who may be fully occupied by other tasks.

At the national level, a master plan has been prepared for NARC. Knowledge of the plan's contents does not appear to be widespread, nor does there appear to be much commitment to it. Completion of a plan is a beginning, not an end. Steps must be taken to assure that it is understood and accepted throughout the research network.

Some provinces have begun to develop provincial agricultural plans, although those we saw were still in draft. We are concerned that provinces are proceeding independently and not fitting provincial plans into any national plan. The scarcity of resources requires complementarity to achieve optimal results.

Few comprehensive long-term plans appear to exist at the institute or department levels, although the adequacy of such plans cannot be judged without reference to completed national and provincial plans.

The annual plans we reviewed would have benefited from greater attention to resources availability and problem focus. Most scientists are quite capable of preparing sound research plans, given good guidelines and supervision; however, some assistance and monitoring may be required. The key to the utility of a research work plan is not just design, but careful monitoring of the plan's execution, evaluation of the quality and relevance of the science, and regular revision.

Given the fact that a plan has been developed for NARC and a draft plan has been completed for ARI/Sariab, PARC should consider preparing an overall national research plan with broad guidelines and objectives, and then working with NARC and provincial institutions to ensure both that the plans are complementary and that research requirements are satisfied.

A2. Adequacy and Utility of Research and Extension Plans

In summary, a comprehensive national research plan does not exist. A NARC research master plan has been prepared but has not been implemented, and similar plans have been or are being developed only for AZRI, Baluchistan, and Sindh. The WB ARP-II program will seek to strengthen planning and management at the provincial and federal levels.

A review of the extension plans was not carried out as a part of the present evaluation, nor do there appear to be any formal joint planning arrangements. However, the team was concerned with the interface between research and extension. Scientists we met in the research institutes seldom mentioned extension staff collaboration in developing their research agenda. Many stated, "We will develop the improved technology and take it to the farmer." When questioned, they said that collaboration with extension staff members is important for dissemination. There was little evidence of planning for such collaboration, except with farming systems research (FSR). The FSR staff always mentioned extension service collaboration in the dissemination of improved technology.

We consider it essential that increased planning and cooperation be carried out by research and extension in the interests of effective use of resources available to address the critical problems of agricultural development. The extension service has a well established infrastructure, is reported to have adequate mobility and other facilities, and has a staff able to assume greater responsibility. Research and extension would both benefit from joint planning and execution of a mutually agreed upon program.

A3. Adequacy and Effectiveness of Scientific Staff and Research Infrastructure

The MART project has been very successful in training a significant number of well-qualified staff and providing transport and scientific and field equipment. By and large, the research infrastructure in terms of buildings, equipment, and land is adequate, but adequacy at one point in time is not a sufficient measure. Rather, adequacy must be constantly reviewed, staff development continued to replace retiring staff and upgrade existing staff, and equipment and research infrastructure maintained, repaired, and upgraded as needed. It is a continuous process for which planning and funding is required.

The effectiveness of the scientific staff and their use of facilities at their disposal could only be judged on the basis of limited observation and discussion. Some very good examples of staff effectiveness were observed in specific commodity programs such as wheat, rice, maize, cotton, fruits, and pulses, and in the disciplines of entomology, plant pathology, and water management, among others. However, the evaluation team came away with an impression that the potential of the scientists and available facilities is much greater than the present output. Scientists consistently attributed low output to lack of operating funds and torpid administrative procedures. Both are no doubt factors, but the team believes that considerably more could be accomplished with better allocation of existing resources.

Two things stand out that constrain effectiveness. First, well-trained graduates returning to positions in the network do not appear to be given the opportunities needed to effectively use and extend their knowledge to other scientists and teachers. The considerable emphasis in the system and the culture on seniority diminishes optimal use of qualified junior staff. Second, conducting research under scarce resource conditions requires effective planning and implementation of their use. The need to focus on a few priority problems becomes critical to optimize complementarity among scientists and scientific and technology transfer institutions.

A4. Linkages among Research, Extension, and the Private Sector

One of the important changes in the 1990 MART amendment was to focus attention on the interface between public sector agricultural research and dissemination and private agribusiness. The goal was to involve agribusiness institutions in determining the research agenda and obtain their support and collaboration in carrying out research and technology transfer.

PARC has established a Directorate of Agribusiness Relations and issued an excellent policy statement on relations with agribusinesses. The directorate has published a

comprehensive directory of agribusinesses in Pakistan and some 20 contracts or memoranda of understanding have been executed between the directorate and agribusiness firms. A technical advisor has been provided through Winrock International under the MART project.

The concept of expanded agribusiness collaboration with research is excellent and timely and has been effective in many countries. Pakistan needs to gain further support for its research and dissemination activities, and agribusiness has the potential to provide such support. Getting the job done is difficult, however, as both research and agribusiness need not only to understand the mutuality of their interests, but to learn how to establish dialogue.

The team observed very little understanding of or interest in the private sector among scientists in provincial institutions. Although there is greater interest at the NARC and PARC level as a result of the successful negotiation of contracts with the agribusiness community, there was not a great deal of activity in the ongoing pursuit of collaboration.

If the collaboration between PARC and agribusiness enterprises is to become effective, the evaluation team believes a greater institutional effort is needed to convince provincial staff and administrators of the value of such interaction. Further, it will require greater effort on the part of the Directorate of Agribusiness Relations and the TA advisor to maintain contact with the top management of firms and provide them with evidence of mutual benefits.

PARC, with USAID support, is to be commended for its effort to link research with the agribusiness sector for mutual cooperation and benefit. We encourage it to pursue this issue more aggressively.

A5. Self-appraisal of Strengths, Weaknesses, and Accomplishments

The leaders of the national and provincial research institutions are quite realistic about their strengths and weaknesses and are willing to discuss them frankly. Each institution has had significant accomplishments in terms of technology developed and adopted, and productivity and output of important food crops and cotton have increased as a result.

The key strengths are the large and generally competent staffs (including a number with doctorates and master's degrees) and the research output. Weaknesses are primarily seen in administrative problems and the level of budget support for operations.

There is little stated concern (positive or negative) about the quality of research, development of well-qualified younger staff, or the tendency toward institutional inbreeding (a persistent problem, according to qualified observers in the Pakistan scientific community). Scientists want something done about these issues, but they appear not to know how to bring about the kind of change required, or even how to begin.

A6. Suggestions for Improvement

Agricultural research planning would benefit from PARC action to develop a national agricultural research plan to identify broad objectives, priorities, and resources consistent with the national plan for the agricultural sector as a whole. Following development of its own plan (through a national forum or some other means) PARC would seek to generate commitment of scientists in the national network to the guidance provided.

As a part of this process, the NARC master plan may be examined for some possible changes. To an outside observer, it includes an excessive number of priorities, given the present and potential resources available. It would also benefit from more attention to monitoring and evaluation and a better presentation of its role vis-à-vis the work of provincial research institutions.

PARC should therefore provide guidelines and assistance to develop plans at the provincial and institutional levels and then monitor the consistency of these plans with national needs and complementarity within the national agricultural research network.

Collaborative planning and methodical cooperation is essential for the joint well-being of research and extension. Each needs the other in order to be optimally effective.

The main instrument of research is the scientist. Other things equal, the better the scientist, the better the research. Good scientists have to be well-trained, both in the universities and on the job. The quality of Pakistan university staff should be systematically upgraded and interchanged so that the graduate degrees they award are fully equivalent to those received abroad. As interim measures, these schools might consider expanding the practice of awarding joint Ph.D.s with other institutions and providing opportunities to the faculty for postdoctoral study abroad.

Young people selected for long-term degree training who successfully complete their Ph.D.s should be given the opportunity to extend their training to colleagues, through group training and on the job. Team research and team teaching are two proven methods for improving general institutional capacity.

Finally, while Pakistan's problems may be ecologically isolated, their solution need not be. Science is an international enterprise, where full and frequent interchange among those working on similar problems strengthens all. PARC and each segment of Pakistan's agricultural research system should assiduously pursue opportunities for international interchange. The BOSTID program is demonstrating the benefits of one kind of interchange, and the IARCs have demonstrated another.

B. GOP's View of MART and the Research System

The consensus in GOP circles is that the MART project has made a commendable contribution in upgrading the research capability of NARC and provincial research and education institutions by providing scientific equipment and training scientists. The current

and potential impact of close to US\$10 million of equipment cannot be denied. More than 80 scientists trained to Ph.D. or M.Sc. levels abroad and 188 more were exposed to shorter-term specialization in agricultural science and research management—a powerful investment in the nation's agricultural research and education system.

The systems's nine principal institutions and PARC are deeply grateful for the computers provided to many research sections. PARC has high praise for MART's help in computerization of both PARC and NARC accounting systems. The former is fully operational; NARC's will be within three months. Both are patterned on and compatible with the system developed by CGIAR for the IARCs.

Provision of audiovisual equipment and training staff in its use has revolutionized the potential capacity of information transfer. The growing capability for producing radio and television modules for technology transfer enables institutes to exploit electronic media for dissemination of recommendations to the rural and urban communities alike.

Strengthening the NARC national library and Pakistan's 17 decentralized agricultural libraries has been enormously useful. Provision of and training for computers, CD-ROM readers, and machine readable databases, microfiches and photocopiers, as well as support from a central facility, has similarly revolutionized the scientific reference capability. Formal CD-ROM database searches grew from 289 the first year the system was installed, to 895 in 1991, and then declined to 615 as other libraries came on stream with their own systems. Besides providing a quantum jump in information input to research, this activity has demonstrated PARC's special importance to the entire system in coordinating research support.

The integration of various subject matter specialties under the FSR project provides a model for the relationships research and extension the farming community. There is some concern, however, that the present setup may not be financially sustainable. How long will the message transmitted by this heavy input to a small target area persist after the camp is shifted to some other site? The possibility of transferring the system to the provincial extension wings is being considered and motivating the extension service and its massive infrastructure to adopt an FSR approach is under discussion. The communications network strengthened by MART project can be of great value to the extension service in the rapid transfer of new technology.

MART's contribution to building up AZRI in Baluchistan is applauded. This recently established decentralized federal institution, intended to provide research in the highland arid zone, had limited facilities and few qualified staff when MART started. The ICARDA team helped plan a long-term research strategy and provided moral support and technical and managerial advice during a long period when few Pakistani scientists were willing to accept AZRI posting. With the help of MART, and a strong push from the PARC member for natural resources and chairman, all research sections are now functional and carrying out a comprehensive program. However, staff to carry out these programs remains very thin, frequently with a single specialist handling a broad area.

The interaction of public sector research and agribusiness is an idea that is being watched with a mixture of hope and skepticism. The potential and methods of this concept will become clearer once it has survived the incubation period. Scientists unfamiliar with collaboration with private firms are dubious about the financial relationships. The cost to the farmer of embedded technology generated by the public sector was sometimes subsidized by scarce research funds in order to get it adopted rapidly. Acceptance of responsibility for such technology transfer by the private sector will relieve the research program of this function and cost. However, the commercialization of technology also raises questions of the ethics of benefit incidence, i.e., who profits and by how much? Scientists tend to be conservative and are waiting to see how this new concept develops.

The BOSTID Program has been received with great appreciation. It not only provides technical and financial assistance, but ensures that this assistance results in the achievements envisaged under specified projects. Grantees particularly appreciated the close interaction with highly competent U.S. scientists.

C. Performance of the Technical Assistance Teams

C1. Winrock International

The cost-reimbursable contract for Winrock International to provide technical assistance in research management and administration, information transfer, and training was initiated on April 1, 1986, and will terminate in March 1993 unless extended. Five long-term expatriate advisors were funded under the project, each for three years:

- Chief of party/research management and administration advisor
- Training advisor
- Information transfer advisor
- Farming systems research advisor
- Provincial research advisor

The COP's contract was extended to four years. The training advisor resigned at the end of his second year the savings enabled and a second provincial research advisor to be appointed for two years.

The original provincial research advisor is the sole remaining member of the long-term Winrock team. He has been named chief of party and moved his residence from Lahore to Islamabad. His contract is coterminous with the Winrock contract scheduled to end in March 1993, but a request is being made to extend it into September 1993. One short-term local consultant has been engaged by Winrock to assist the Directorate of Agribusiness Relations. His contract is also scheduled to terminate in March 1993, but would also be lengthened as part of the Winrock extension.

All Winrock long-term staff, with the exception of the training advisor, completed their full terms of appointment, and from all reports they worked well with their Pakistani colleagues and were appreciated for their competence, performance, and dedication to the

program. They made a lasting contribution to the development of a strong national agricultural research system. The present COP, Dr. Takumi Izuno, has more than 20 years of experience in Pakistan and his knowledge, advice, personality, and outstanding technical competence have won him great respect among his colleagues. His personal contribution to the project is outstanding.

The Winrock COP through 1992 was the advisor for research management and administration. His many duties as COP and the limited support provided for this area of work hindered any significant achievements in the improvement of research management and administration in the agricultural research network. Moreover, bringing about significant changes requires very high-level commitment and support beyond the control of PARC.

The MART contract provided for 224 person-months of short-term technical assistance; of this, 151 person-months have been used for 102 consultancies in federal and provincial activities. Winrock is given credit for identifying appropriate and well-qualified consultants who, with few exceptions, completed their work in a timely manner and with full documentation of their findings and recommendations. The funds for the balance of the LOE have been transferred to short-term training for the provinces.

The 102 consultancies may have overloaded the system, though, as recommendations from a number of them were never acted upon and may have passed their usefulness by now. The terms of reference for short-term consultants were agreed on between PARC and the beneficiary institution; Winrock's role was to follow up with identification and appointment of consultants and ensure that the assignment was properly carried out and documented. In 1992 a consultant was engaged to review the mass of consultants' reports and identify appropriate recommendations. The consultant reviewed 142 reports (not only those provided by Winrock under MART) and did an excellent job. Follow-up by PARC on M. N. Chaudhri's report of August 1992 is strongly encouraged.

Winrock's long-term advisors have done an excellent job in documenting their work with PARC, NARC, and the provincial institutions, and their interim and end of tour reports are well presented, informative, and forward looking. The end of tour report by the COP Bill C. Wright, dated March 1992, provides an excellent overview of the life of the project and summarizes very well its achievements, areas where less progress was made than desired, problem areas, and visions of the future.

C2. ICARDA

The ICARDA component of MART project is tied to the development of AZRI in Baluchistan. AZRI was originally given the responsibility of arid zone research throughout Pakistan, with substations in other provinces. In practice, its activities have been confined to the highland arid zone near Quetta because it lacked the resources to supervise work at other stations. AZRI and ICARDA are currently considering shifting more attention to the highland, monsoon-watered grasslands centered on Loralai and grazing management on the upper watersheds of these highlands. Such a move is also in keeping with ICARDA's multi-country research strategy and would ensure continuing liaison.

ICARDA has provided a number of experts in critical fields, under contract and later as a grantee:

<u>Position</u>	<u>Specialty</u>	<u>LOE</u>
Chief of Party (initial)	germplasm	48 p/m
Chief of Party (current)	range & livestock	31 "
Agronomist	soil and water	48 "
Range Scientist	range & livestock	36 "
Farming System Research	(resigned)	24 "
Extensionist	communication	36 "
Agronomist	water harvesting	15 "
Agricultural Economist		<u>13 "</u>
Total (person months)		251 "

Both COPs were paid from the ICARDA core budget. Salaries of the rest were part of the \$4.5 million invested by MART in this component.

The input of these experts has been commendable, both in helping organize AZRI for work in various disciplines and as participating scientists. They helped AZRI scientists make a number of accomplishments, summarized below.

Achievements of the Germplasm Evaluation Section include two superior bread wheat lines (Gerek and ICW 1471) for winter planting in highland areas. These lines are resistant to yellow rust, drought, and cold. Five barley genotypes have also been selected for upland Baluchistan and among them *Arabi abiad* has been selected for both winter and spring planting. Some genotypes have earlier maturity and can escape terminal drought. Two bold-seeded lentil lines (ILL 5865 and ILL 5677) have been selected as food legumes and *Vicia dasycarpa* and *Vicia sativa* have been picked out for winter and spring planting, respectively. Seed multiplication of desirable types has also been taken up.

The Agronomy Section has been engaged in evolving practicable water harvesting methods, like strip cropping. The group has also tested different cereals and legumes to pick up the best ones under highland conditions. Soil fertility is also under study and an animal drawn 3-row drill has been introduced to facilitate planting of cereal crops.

The Agricultural Economics/Farming System Group has studied marketing constraints and opportunities available to livestock producers, and field data have been collected to evaluate farmers' perceptions of water harvesting technology and assess the adoption potential of new techniques. This group also provides linkages with PARC FSR and other activities in the Baluchistan Province.

The Livestock Section has performed nutrition studies on sheep and goats, including the nutritive evaluation of *Atriplex spp.* and cultivated forages. Almost 80 percent of their nutrient intake comes from grazing and thus 20 percent has to be met (but frequently is not) through supplemental feeding. Winter supplementing of breeding stock (flushing) can

increase the lamb crop by 50 to 80 percent. The studies also demonstrated a high incidence of endoparasitism, control of which significantly reduces mortality.

The Range Science Section has designed its program for rangeland productivity around the introduction of a number of grasses and shrubs. One of the most promising shrubs identified is *Atriplex canescens* (four-winged saltbush), which is extremely drought- and cold-resistant.

C3. BOSTID

The Board of Science and Technology for International Development (BOSTID) is a unit of the U.S. National Academy of Sciences (NAS) that arranges for scientists to work with USAID on scientific problems. MART funds were granted to BOSTID for the development of a three-year competitive grants pilot program involving Pakistani and U.S. scientists. The program objective was "the development of technologies...into marketable products which are environmentally sound and promote the sustainability of Pakistan's agricultural system." An unstated objective was the demonstration of a model for international scientific collaboration with public-private sector involvement to solve problems of environmentally stressed areas.

The \$3 million grant included \$1.44 million for competitive research grants plus \$1.56 million for BOSTID administration and international travel for U.S. scientists. PARC provided a program coordinator and staff to facilitate this work. The first 12 months of this project were devoted to advertising for and competitively selecting research grants from the 117 proposals received. A review committee of six Pakistani and six U.S. scientists helped rewrite these grant applications, compared them, and finally funded 25, seven of which were small grants of less than \$30,000. The grants supplement establishment expenses, providing only additional research expenses, minor immediate equipment needs, and international travel. The 25 grants were formed into five groups overseen by six U.S. scientists who come to Pakistan periodically to review work on site. The evaluation team met three of these scientists, who are enthusiastically devoted to the program.

The results in less than a year of actual operation are seen by both U.S. and Pakistani participants to be very positive:

- Pakistani scientists (1 to 5 per grant) may receive a supplement of one-twelfth of their annual salary, get help in laying out experiments, and obtain financing for immediately required research assistants and equipment. The U.S. scientists receive only travel expenses.
- There is excellent close scientific follow-up, creating a sense of how to do science. A permanent linkage with U.S. scientists is being fostered.
- If this program continues to achieve its potential, the GOP and other donors may well decide to finance an additional round.

Our conclusion is that this program is an excellent demonstration of how a competitive grants program can stimulate scientific endeavor. The elapsed time is too short for generating the technological products expected from these activities to-date; however, the work appears to be on track. If the results are as anticipated, we believe (and strongly recommend) that PARC continue to support this model.

Outside this program, but also funded by MART, USAID has secured BOSTID collaboration to arrange a meeting at PARC on agricultural research and the private sector involving private sector leaders, senior scientists, and the Ministers of Agriculture, Education, and Science and Technology. It will arrange a U.S. tour for a delegation headed by the chairman of PARC to demonstrate collaboration between the private sector and the U.S. research establishment.

D. MART Project Accomplishments

D1. Inputs

The amended MART project was originally authorized at a level of \$38 million. Application of the Pressler Amendment reduced this amount to \$33 million. Ninety-eight percent of this amount was committed as of December 31, 1992, leaving an uncommitted balance of \$698,157 to complete the remaining 22 months to the PACD. That amount has since been committed or earmarked.

The following information is summarized from Abdul Sattar Alvi and Sheikh Muhammad Kamal's "Status Paper on MART Project for 2nd Interim Evaluation," December 1992. This document references the planning figures in the GOP PC-1, which were based on the amended Project Paper. Reduction of the authorized amount by \$5 million (13 percent) has similarly reduced the total level of inputs, but not always by that percentage in each category.

D1a. Technical Assistance

Technical assistance was provided under long-term contracts or grants with Winrock International, CIMMYT, and ICARDA. The following table provides the number and use of advisors in person-months by duration and type.

	Residential	Short-term	Local
Planned	728	224	130
Used	19/707	94/151	10/119
% Use	97	67	92

Funds left unused for short-term advisory services were converted to short term training.

D1b. Training

Long-term international degree training. A total of 96 degree training slots was allocated among the federal and provincial research and education institutions, largely on the basis of population. Of these, 85 were filled; those unused were generally the result of an inability to meet academic and/or language requirements. Nearly all of the long-term slots were for the Ph.D., requiring a four-year training period, but a few were for the M.Sc., usually acquired in less than two years. At this point, 42 of the 85 LT participants have returned, only four without degrees. Distribution by subject matter was as follows:

Soils/Agronomy	23 percent
Animal Science	18 "
Plant and Biological Science	22 "
Range Mgmt, Forestry, Fisheries	15 "
Social Sciences and Education	15 "
Engineering and Irrigation	7 "

USAID's Development Support Training project asks returned participants to respond to a 43-item exit questionnaire. Its report for the 1983-1992 period reported only on 33 trainees—only eight of which were degree-oriented—and only on 19 of the 43 items. We were unable to draw citable conclusions from the small sample size and summarized presentation, nor did we have the time to probe more deeply. However, the types of information included suggest the desirability of a more penetrating study of the database.

Short-term international non-degree training. All 183 short-term slots, totalling more than 600 training months, were subscribed. Only 34 (one-fifth) of this training focused on research management and methodology, project management, or administration; most of the remainder was directed at production agriculture or biological sciences, with a sprinkling of social sciences and training coordination.

Those who participated in technology training expressed strong appreciation of its utility. Management trainees felt the training course was too general to be useful, though they benefited from the hands-on exercises and field observations.

International observation visits. Fifty individuals made a total of 59 observation visits of a few days to a few weeks each under the MART project. The primary objective of these visits was to participate in conferences, workshops, or seminars in their specialties on the invitation of international agencies and research organizations.

In-country short course training. MART financed 141 short courses for a total of 4,685 persons, about eighty percent of whom were from the provinces. This amount was only about 70 percent of the short courses programmed in the PC-1, but 98 percent of the planned attendance. A significant number of these courses were offered in the provinces.

D1c. Facilities and Equipment.

Laboratory and field equipment. MART provided laboratory and field equipment valued at more than \$4 million in the first phase of the project. most of which went to provincial universities and agricultural research institutions. The procurement of part of this equipment was mishandled, however. Some specifications were changed, resulting in equipment unsuited to the need, and some was delivered with missing parts, operating manuals, or other deficiencies. Many of these problems have been remedied, so that most equipment has been put to good use by receiving institutions, but some items remain unusable. While most of the equipment is being used and properly maintained, recipients have been unwilling or unable to repair the remaining equipment themselves or seek innovative solutions to place it into use. There are virtually no service facilities or staff trained in maintenance of laboratory equipment other than LEMRU, and this unit has not provided effective services to provincial institutions.

Computers. The MART project has had a pervasive effect on computerizing the Pakistan agricultural research system, including the accounting systems at PARC and NARC; introducing CD-ROM technology and machine readable agricultural databases on compact discs; and massive distribution of personal computers (PCs), software, and peripherals throughout the system.

We observed superior care and active use of these computers. Training was provided to all recipients of PCs, and there are enough practiced users to serve as mentors for the neophytes. We saw computer training laboratories in two universities and at NARC, and unlike laboratory equipment, private sector computer service facilities abound.

Computers were distributed widely not only to scientists, but also to administrators in research and education institutions and to provincial Secretariats of Agriculture and some decentralized stations. The bulk of the computers were general purpose desktop models, but 10 desktop publishing machines with computer graphics were provided primarily to the PACS, as were most of the nine laptops. PARC and NARC received 53 machines, including 10 for the computer training lab. Sindh, which received 102 computers (80 of which went to SAU), beat out the Punjab with 49 and NWFP and Baluchistan with 13 apiece.

Vehicles. MART financed a varied lot of 88 vehicles which were distributed throughout the project and to long-term advisors. Most vehicles were pick-ups, land cruisers, or station wagons, but there were also a few small buses and light sedans. The vehicles we saw and travelled in were in good condition and well maintained. However, these vehicles are aging and will need replacement over the next few years.

Buildings. Mart financed the construction of the AVC (audiovisual communications) and training building, which is now complete except for air conditioning (now being installed) and has been occupied.

D2. Outputs

D2a. Private Sector Contribution to Planning

One of the important changes of the MART amendment in 1990 was to give priority to an interface between public sector agricultural research and dissemination and private agribusiness. The goal was to involve agribusiness institutions to help determine the research agenda and for support and collaborate in carrying out research and dissemination.

PARC has established a Directorate of Agribusiness Relations led by a director and deputy director. Under the MART project, a limited amount of technical assistance is being provided by one advisor contracted through Winrock. A number of short-term consultants have also provided inputs to assist in the development of the directorate's program.

A study has been completed by the directorate to document agribusiness institutions in Pakistan. Further, 20 contracts or memoranda of understanding have been completed between the directorate and agribusiness firms, and plans are well advanced for a high-level mission of Pakistani agribusiness and research leaders. The objective is to bring greater attention in those firms with agribusiness interests in Pakistan to the opportunities for mutual benefit from collaboration in research and development activities.

During this evaluation, the team observed very little understanding or interest by the provincial institutions in this part of MART. Further, there is little evidence of any significant inputs by the private sector in research planning. However, the work in this area was only begun in 1990 so it is too early to expect significant support. The concept is excellent and timely and has been effective in many countries, and Pakistan needs to gain further support for its research and dissemination activities. Collaboration with agribusiness is a proven way to obtain such support.

PARC needs to continue and expand its discussions with senior scientists and administrators in provincial institutions on the advantages of collaboration between the public and private sectors in research and dissemination.

D2b. Research Prioritization and Master Plan Implementation

NARC has developed its master plan for 1988-2000, developed through an interactive process including scientists, administrators, and policy makers. Priorities were established, staffing and financial requirements determined, and research topics specified.

The master plan is a well-written document reflecting the very considerable effort required to complete it. As a result of what appears to have been a very interactive process, one would expect broad-based support for it and greater implementation. It appeared to the evaluation team, however, that there was limited support for the plan, and that even at NARC, implementation has been very modest.

The plan probably lists many more priorities than can be managed with available resources and proposes a complete research program covering many topics that should be the responsibility of provincial agricultural research. NARC was established to be a center of excellence in agricultural research and therefore should limit its research to those areas that cannot be covered by provincial institutions or are best controlled at the federal level. In this regard, a national agricultural research center generally controls plant and animal germplasm introduction, storage and maintenance of plant germplasm, plant and animal quarantine, a national agricultural library, and specialized laboratories that are central to the provinces and can provide services to all institutions without duplication.

D2c. Farming Systems Research

Farming systems research is more of an approach to research than research itself. It attempts to look at farmers' systems as a whole, emphasize multidisciplinary research, and involve the farmer so that his/her needs and limitations are understood. Once the problems are identified, research focuses on resolving the problems or available results are introduced that are applicable to the situation.

Under the MART project, farming systems research has been introduced in each of the provinces and a national coordinating unit has been established in PARC. In each province target areas have been identified for activities in the FSR program. Very little research is evident in resolving agricultural problems in farming systems in the target areas; rather, the work is essentially an extension of recommendations already in hand from previous research. In the target areas observed, work on farming systems seemed to reflect the scientific interests of the farming system teams rather than a concern for the total system of the farmer.

The farming system teams and the coordination unit at the national level are highly motivated and have demonstrated an excellent rapport with the farmers with whom they work. They are no doubt making an impact in the target areas. However, there are some significant issues that must be addressed in looking to the future of the FSR program. First there is the question of necessity. The extension service staff operating in each of the provinces have a responsibility to carry out the activities associated with FSR. Also, research scientists themselves should understand the problems of the clients they serve and should ascertain that their research results are applicable, economically viable, and socially acceptable. They should not require an intermediary in the form of a farming systems team. Further, there is the question of sustainability. The financial costs incurred in each of the target areas are very high and well beyond the capability of provincial governments. More economical means must be found for problem resolution at the farm level, and the most obvious step is to motivate extension staff and provide modest additional support to bring about a more effective relationship between farmers and research through this staff.

D2d. Arid Zone Research

This research is the responsibility of the Arid Zone Research Institute (AZRI) headquartered in Quetta, Baluchistan. The MART project has supported development of the

technical and human resources of the institute. In addition to its center in Baluchistan, AZRI has substations at Umerkot in Sindh, at Bahawalpur in the Punjab, and Dera Ismael Khan in the North West Frontier Province. While the geopolitical and ecological mandate of AZRI covers about 50 percent of the country's land area, it involves only about 10 percent of the human population. Its scientific mandate includes livestock management, range management, crop management, and agricultural economics.

Since 1981 AZRI has received technical assistance from the International Center for Agricultural Research in Dry Areas (ICARDA). However, starting in 1985 and up to the present, with support under the MART project, assistance was intensified and has been extremely beneficial. Staff from ICARDA have been supported under the project, long-term training for selected AZRI staff has been provided, and significant program support costs have been covered. As a result, AZRI has made significant progress since the 1989 midterm review and, while still in the early stages of development, has demonstrated its potential in range and livestock management and agricultural economics. In crop management, there remains a need to establish a closer relationship with the provincial agricultural research institute to assure complementarity and eliminate potential duplication.

An issue that needs to be resolved is AZRI's geographic mandate. As a federal institute it has substations in the Sindh, Punjab and North West Frontier Province, but does not have the resources (human or financial) to support research work at these substations. Additional resources are required from the federal government or the provinces will need to take up the costs for the stations.

AZRI is making good progress but is still a fragile institution and will require substantial support for a number of years. Fortunately, at least some of this support may come from ICARDA, which has an interest and a responsibility in the region.

D2e. Economic and Social Science Program

Research in the social sciences within the national agricultural research system has lagged behind the agricultural sciences. However, significant improvements have been achieved and the evaluation team observed that the Agricultural Economic Research Units are making positive contributions to the research programs.

D2f. Research Grants Program

The research grants program—jointly coordinated by PARC and the BOSTID—has gotten off to a very good start. Grants for Pakistan scientists to conduct research focused on increased productivity of environmentally stressed lands are linking awardees with outstanding U.S. scientists and institutions with similar interests and providing interaction on scientific issues.

Although the BOSTID program is in its early stage, it has already aroused much enthusiasm and scientific support from U.S. and Pakistani sources. The program is seen as a mechanism to foster scientific interaction at individual and institutional levels at costs well

below the very large programs carried out in the past. Support will be needed for a number of years for the research grants in order to gain lasting benefits. The benefits from this program should be very substantial in relation to their financial cost; the program provides an excellent means to continue to gain benefits from past program investments in training and institutional development.

D2g. Private Sector Dissemination

Private sector dissemination of research information is in its infancy in Pakistan in terms of disseminating the results of joint research or work other than product research. Some multinational companies are already carrying out research on products they manufacture, such as insecticides, fungicides, etc.

Dissemination is an area where cooperation and research achievements between scientists and institutions in the national agricultural research network and agribusiness enterprises must be attained before any significant progress may be expected. It has potential for the future but will require greater collaboration than is evidenced at present.

D2h. Audiovisual Production

One of the major tasks of Winrock's information transfer advisor was to help establish a multimedia production capability within the national agricultural research network. The center for this activity would be a building at NARC headquarters which housed a modern studio. The advisor was also to help establish production capabilities in selected provincial organizations and assist in furthering information transfer to farmers, extension workers, and policy makers.

The terms of reference for the information transfer advisor were well defined and the person appointed was qualified to carry out his assignment. The advisor was very successful in establishing Provincial Agricultural Communication Support Cells, arranging equipment for them, and providing training. All PACSCs are functioning although there is considerable difference in the amount of material produced and the quality of their productions. Additional training and in some cases staffing, is required. The long and continuing delay in the installation of air conditioning equipment has handicapped all of the PACSCs.

The centerpiece for the audiovisual work is a building for the Multimedia Studio at NARC. This facility is noted by the information transfer advisor and Winrock COP in their end of tour reports as an excellent physical facility that is very well equipped, except for the air conditioning. The director of the unit at NARC, in his meeting with the evaluation team, faulted the building design and equipment and noted many features that in his opinion were inappropriate for such a unit. PARC may wish to review the situation to determine whether these deficiencies are real, and if so make adjustments before the construction is finalized.

The national agricultural research system now has the facilities for multimedia production and the potential to enhance the transfer of technology. It is the view of the evaluation team that the quality of the products will need to be substantially improved before

any major impact can be expected. To achieve this, additional training for PACSC staff is required in script writing, editing, production, and quality control. Maintenance and repair will be a continuing issue for the federal and provincial organizations to keep the specialized equipment in good operating condition.

D2i. National Network of Agricultural Communicators

The Pakistan national agricultural research system includes many documentation, publication, and information units. Under MART the network of communicators was supported and brought into a more effective and cohesive arrangement. The National Technical Information Transfer Committee (TITC), composed of leading agricultural communicators from private and public organizations (both federal and provincial), was established. In his end of tour report, the information transfer advisor noted that the TITC's leadership role was not sustained. As a result, Provincial Information Transfer Committees (PITCs) were organized to do at the provincial level what the TITC and PARC were to do nationally.

The PITCs gave direction for the establishment of the Provincial Agricultural Communication Support Cells. PACSCs were established in Faisalabad, Lahore, Peshawar, Quetta, and Tandojam, and MART provided each with the same equipment and training. The equipment, for the most part, is for audiovisual production work. The PACSCs are linked to the Multimedia Studio at the NARC, which was also developed (including its building) under the project.

In reviewing the PACSCs, all of which were visited by the evaluation team, considerable variance in quality and quantity of output was noted. Equipment is still to be put in use in most of the units. Nonetheless, federal and provincial staff in the agricultural research network are very positive about their initial impact and potential.

A good base is in place for a national network of agricultural communicators. Modest support, additional staff recruitment, and training should result in a well-recognized and productive network that will play an important role in technology transfer.

E. Gender Concerns

Women in rural areas are fully involved in farming activities, and the development of agriculture cannot overlook the contribution of half the population. Yet it regularly does and Pakistan and the MART project are no exceptions.

In this evaluation, we observed a few professional women working in PARC, NARC, and the provincial universities. Women students now make up only two percent of the enrollment in agricultural universities and most of these are aiming for laboratory, rather than field positions, since their acceptance in rural areas is believed to be limited.

E1. Women's Participation in MART Design, Appraisal, and Implementation

Neither MART nor its predecessor project included a specific activity directed at women. Women's work was included in the FSR component, however, when Winrock employed a local specialist as a long-term consultant. This consultant has been active and effective.

The initial FSR target area of Fateh Jang was selected for a diagnostic survey. Women in Fateh Jang are responsible for poultry, and nearly 90 percent of the households maintain a farm flock. These flocks suffered from low productivity and high mortality due to low nutrition, disease, and parasitism. Two groups of 30 women each were selected for a six-month program of training, demonstration, and visitation. They learned about poultry management, nutrition, control of grain pests, and poultry health (inoculation, parasite control, sanitary measures).

Since most household enterprises stressed egg production, they were provided with a few hens and a male of the high-yielding Fumi strain. The reduction in disease and parasitism and improvement in nutrition, combined with a more productive breed, led to a rapid and sizeable increase in egg production. This increase in turn led to considerably higher incomes, which were noted by others outside the program who adopted the improved practices. Virtually all poultry farmers in the target villages have adopted these practices, which have spread to producers outside the immediate complex.

E2. Gender-specific Data Availability

The Fateh Jang survey included gender analysis of specific agricultural tasks—the only gender-disaggregated data we found in project documents.

E3. Project Effects on Women's Access, Roles, and Conditions

Women retained the additional income obtained from adopting improved practices. They spent this money on improving household and family amenities, notably paying fees for children's education. The women in this project have no problem with seeking assistance from male extensionists, and the latter are accustomed to providing such aid.

E4. Gender Effects on Sustainability of Interventions

The increased income generated from the FSR interventions targeted at women basically assures that these practices will continue and spread in the area. The poultry institute's extensionists assisted the project and will maintain its activities. The FSR staff is now transferring its attention and these recommendations to another target area.

SECTION III

CONCLUSIONS

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A. The Pakistan Agricultural Research System

A1. Structure and Capacity

The basic structure of the Pakistan Agricultural Research System is well-established. Its main components, which MART supports, are four provincial research institutes, three provincial universities, a national center (NARC) and at least one outlying federal institute (AZRI), coordinated by a national research council (PARC). These major institutions are also responsible for the performance of a large number of outlying subcenters, field stations, and experimental farms.

Tensions within the system, caused by its federated nature, have been exacerbated by budgetary constraints, as each part of the system seeks to maintain and improve itself. The provinces have an independent constitutional responsibility for agriculture, including agricultural research, education and extension, so PARC cannot exert direct control over their programs. This leads to a variety of coordinating and support devices which facilitate the development of a collaborative program.

The staff is large, some 4015 professionals. They are generally well trained (460 Ph.D.s, 2851 M.Sc.s), many awarded by prestigious international institutions. Some of these scientists are outstanding. The facilities are more than adequate, largely due to two decades of donor support, but are neither elaborate nor extraordinarily sophisticated. Scientists identify their major constraints as lack of operating funds and the torpidity of administrative procedures. The establishment cost to operating cost ratio has deteriorated over the years as inflation has raised the establishment cost within a stagnant total.

A2. Performance

This scientific establishment has generated adequate technology to enable Pakistan's agricultural sector to generally keep pace with demand. A core of extraordinary scientists in a few key disciplines is supported by competent scientists in virtually all subjects. For example, Pakistan plant breeding generally is of high quality and capable of producing rapidly high yielding, disease-resistant strains of major crops to meet emergent challenges. These strains can be tested quickly against ecological conditions, and multiplied for dissemination. Livestock scientists (geneticists, pathologists, veterinarians, nutritionists, range and pasture experts, etc.) similarly contribute to Pakistan's need for dairy and meat products.

The Pakistan agricultural research agenda is highly endogenous, since most scientists have limited direct contact with farmers or agribusiness. They rely on extensionists to learn

about farmer problems, while feedback from agribusiness occurs primarily at the national coordination level. This does not mean that scientists are "out of the loop." As intelligent and informed professionals, they are cognizant of national priorities and problems, which their research addresses in their respective fields. On the other hand, there is little doubt that a closer relationship with farmers and agribusiness would keep them better informed about the constraints, parameters, and opportunities perceived by these clients, and perhaps improve the effectiveness of their research. The FSR program and the agribusiness relations cell are MART-inspired efforts to facilitate such participation.

Transfer of technology is an area of concern, but we were unable to ascertain the effectiveness of either public sector extension or agribusiness production and sale of technology embedded in product. Pakistan has an exceptionally broad extension program, with a total staff of close to 50,000 workers. However, the channels of communication between farmer and the research establishment may be clogged by the layers of extension workers, including their adaptive research staff.

A3. Management

Management of agricultural research continues to be a major concern, and we noticed little improvement due to MART interventions—perhaps due to major constraints about which MART could do little, including inordinate delays caused by GOP administrative procedures. Autonomy was supposed to release this constraint, but had no noticeable effect until the present chairman ceded larger discretionary responsibility over use of funds to program leaders. Some scientists still feel overpowered by administrative types who use the rules to obstruct rather than aid.

The other intractable constraint is the static budget and the growing disparity between establishment costs and operating funds. Lack of discretionary funds also played against the administrative constraint, since administrators are unwilling to liberalize control of very tight resources. Both of these obstacles are now being overcome, first through a larger budget which expands the establishment:operations ratio, and second, decentralizing responsibility and authority over operating funds to the research program directors.

Management style at the highest levels of the research system has changed considerably in the last two years. Although PARC leadership has always been provided by outstanding individuals, the former style of management was of the centralized command and control type, which focused responsibility at the top of the pyramid. Current leadership is more attuned to the decentralization of authority and responsibility towards the lowest practical level, with an expressed willingness to accept errors in order to release creative energy. The team prefers the latter style in a research establishment where the primary productive tool is the individual scientist.

B. The MART Project

B1. Strengthening System Capacity

Staff Training. More than 80 candidates were sent for degree training for periods up to four years. More than half have returned (with 38 doctorates and 3 master's degrees, all but four successfully completing their work), creating a significant mass of internationally trained scientists. However, it will be several years before all have come back, and even longer before their expertise can be diffused within the system. This process could be accelerated by an effective re-entry program.

Short-term international scientific training has been appreciated and well-utilized by participants who found it benefited their current positions. Management training, however, was believed to be too general, and has not been effectively utilized.

Internal training financed by MART and delivered by the NARC Training Institute has been massive and effective, particularly when training has been associated with delivery of particular equipment, e.g., computers and library databases.

Equipment and Facilities. With the exception of some laboratory and field equipment which was unsuitable, broken, or incomplete, laboratory equipment and computers are being properly maintained, and are contributing to scientific programs. Scientists expressed great appreciation for modern equipment (and considerable disgust over that which was deficient or unsuitable). The team received assurances that these equipment problems are being resolved, as are the air conditioning problems in the AVC-training building.

Over the long run, the computers will probably become a strong factor in the proficiency of research, but they have not been in the hands of scientists long enough to have had a material impact.

Consultation and Facilitation. As noted in the 1989 review and again in Section II.C, the quality of long-term technical advisors has been superior, and working relations among them and with Pakistan scientists and administrators has been positive. Also, as noted in the earlier evaluation, more emphasis has been given in both long-term technical assistance and consultations to science vs. management of science. Response to the recommendations of short-term consultants, however, was almost totally absent.

The chairman of PARC commissioned a review of consultancy reports [Chaudhri, 1992]. This document, an excellent sourcebook, identified and critically reviewed 142 consultancies. It confirmed the lack of response, recognized the cause as lack of a follow-up mechanism, and "recommended that the Monitoring and Evaluation Unit of the Planning Directorate be strengthened and upgraded, and an Implementation Cell be established on a permanent basis to monitor the implementation of the recommendations." We heartily concur.

In evaluating the reports, he found them to be "...quite ordinary in substance..." and suggested that the work might have been done better and at lower cost by local experts. However, the report identifies several as useful, primarily those related to management reviews of PARC and of the MART project, and summarizes or cites their recommendations. One result of this exercise is that MART ceased to fund short-term consultants, absent assurances that no local consultant could deal with the problem.

B2. Improving System Management

Few of the efforts directed at improving systems management have been fruitful. This may be due either to the intractability of constraints to improved management, or to mis-identification of the problem.

Planning and prioritization. Weak planning and lack of prioritization of research have been consistently identified as management weaknesses. Significant effort has been given to preparing master research plans. However, these plans have not been implemented, nor do they apparently guide work plans and annual budgets. One reason given is the lack of funding, which of course contradicts the ultimate objective of planning—to allocate scarce resources for optimum impact. A more probable reason is that all the ramifications of the planning exercise have not been effectively internalized, even though it was highly endogenous and participative.

Resource allocation. Another management anomaly related to prioritization is the failure to deal with the way establishment costs have crowded out available funds to finance research operations. It is unrealistic to expect public sector management to eliminate professional and managerial positions in order to reallocate the savings to operations, and is almost axiomatic that "budget allocation is effective only at the margin," i.e., management has the freedom to allocate resources to operations, but not those committed to maintaining the establishment.

Until very recently, the research budget remained static, so there was no marginal increment to allocate; in fact, the stagnation tended to reduce operating funds in order to maintain the establishment. Since MART didn't contribute operating funds except to pilot projects, it could not deal with this problem successfully. Fortunately, the research budget is now growing significantly, and PARC can address this problem. The PEP (Productivity Enhancement Programme) is a successful reallocation of funds "at the margin" to priority projects. We hope that it is indicative of future research financing.

Research support. MART has had a major impact on providing PARC/NARC with the tools to support provincial research activities. The provision of commodities under the ACE program is one example of massive support. However, some of the potentially most useful tools are in the form of pilot demonstration activities. Several of these have demonstrated significant utility, and may be expected to continue and expand as their potential is realized. Most are still at an early stage of development; they will have to be carefully nurtured and their utility evaluated. Among the most important:

- **Library technology.** Seventeen libraries have been provided with CD ROM readers and databases, microfiche back files of scientific publications, readers and printers, and photocopiers.
- **Communication cells.** Four provincial agricultural communications support cells are equipped, operating, and are supported by a central unit at NARC.
- **Training Institute.** A central unit established, equipped and is in operation, with a significant track record in training staff throughout the system.
- **Farming Systems Research.** A national FSR coordinating office and four provincial units are in operation.
- **Agribusiness relations.** A recently established national agribusiness relations cell is facilitating joint research-agribusiness partnerships. It is hoped that this may lead to similar provincial units.
- **LEMUR.** A laboratory equipment maintenance and repair unit is equipped and in operation. It is hoped that this will also lead to similar provincial units.
- **Competitive research grants.** This BOSTID-managed effort allocates resources competitively "at the margin" to the best scientific endeavors, provides superior mentors on how to do science, rewards innovation and stimulates excellence, and improves international scientific linkages.

C. Long Term Sustainability

C1. Concepts of Sustainability

Any discussion of sustainability must begin with certain assumptions about the nature, value, and level of what is to be sustained. It should not be treated as static—limited to maintenance of *status quo*—but should consider tendencies and the prospective development of the institution and its objectives. Finally, it must accommodate the diverse and changing values of the institution's various stakeholders.

What is to be maintained? In our judgment, the most important critical elements of sustainability in the MART project involve:

- Maintaining integrity of the agricultural research system
- Assuring availability of adequate and appropriate resources
- Providing for continuity and refinement of concepts
- Encouraging scientific excellence throughout the system
- Encouraging responsiveness to client needs

The stakeholders. Many different groups are participants in the operations and/or products of the Pakistan agricultural research system, and as such hold a stake in the

continuity and effectiveness of the system's operations. Stakeholders must be active participants in the system's development, both as contributors and as beneficiaries. This is the only way in which their respective interests can be properly represented.

- **Clients.** Farmers and agribusiness are the primary clients for the system's output. They must adopt improved technology generated by the system, or its output will not contribute to the nation's agricultural and industrial economy. Neither set of clients is solely a recipient, however. Like the scientists themselves, they have the accumulated experience of managing their own enterprises, as well as contacts and information garnered in the process. In particular, they are intimately aware of the constraints and operating parameters of their enterprises, of their problems, and of their needs. Their active participation is essential for defining research problems, adapting their solutions, and rapidly adopting them.
- **Scientists.** Scientists are the essence of the national agricultural research system. The institutions where they work, and the facilities, budgets, and even the regulations which they supply, are intended to facilitate scientific efforts directed at fulfilling national needs. Scientists, in defining the research problem and seeking its solution, require not only a deep professional knowledge of subject matter and scientific methods, but an intimate knowledge of client needs and possibilities. Their linkage with national and international scientists and managers extends and deepens this understanding, and enables them to accept and contribute to the definition of national needs and priorities.
- **Provincial universities.** The provincial universities and their staffs participate in the system both as scientists and as continuing repositories of accumulated results, methods, and specific disciplines. They use both their active participation and aggregate knowledge to prepare professionals to enter and improve the system. The awesome responsibility for the future scientific excellence of Pakistani agricultural research depends largely upon their own assiduous pursuit of institutional and personal excellence.
- **Provincial agricultural research institutes.** Agriculture is essentially a geographically discrete activity, which seeks to optimize the use of natural resources in distinct ecological zones. The provincial ARIs are charged with ensuring that farmers in each zone have a continuous supply of improved technology for their enterprises. To assure that the produced technology reaches their clients, they must maintain close links with the provincial agricultural extension service. They must also keep in close touch with agribusinesses, which sell technology embedded in products and buy, market, and process the farmers' products.
- **National Agricultural Research Center.** NARC serves as PARC's major scientific centralizing force. It tests new concepts and conducts innovative research, and can serve as a mentor for other institutions. As a mentor, its success should be measured by its success in improving the research of other institutions

rather than by how well it performs research that other institutions might handle. It also has major research support functions: germplasm collection, introduction, maintenance, and distribution; maintaining and updating scientific information; training scientists and support staff; maintaining a database of research in progress; organizing (but not always leading) coordinated research programs; facilitating international education and scientific linkages, etc.

- **Donors.** International donors supply funds, equipment, and training which can help the system expand and operate at levels beyond those provided by national contributions. They are also important sources of ideas that can help energize national institutions, thus becoming a source of creative tension within the system. Ideas represent change, which causes discomfort among other stakeholders until they have understood it, internalized it, and adjusted to it.
- **Pakistan Agricultural Research Council.** PARC puts it all together. It defines the system's broad objectives in consonance with the national interest, establishes the ground rules, seeks consensus among the other stakeholders, and assures that their interests are protected. It must find and distribute the resources with equity to strengthen the weak, encourage the laggards, and build excellence throughout the system.

C2. Appraisal of Sustainability

Maintaining an integrated, federal system. A long-term objective of MART was to help Pakistan establish an integrated federal system by strengthening both central (federal) and provincial research and professional education facilities. MART provided international and domestic training, technical assistance and consultancies, and commodity support. This system is not perfect, but is well structured to continue the development of its separate parts and the relationships among them. These relationships are sensitive, and require careful handling. They will be easier to handle if adequate resources are available.

PARC cannot and should not try to mandate or control provincial research. Its efforts should be directed towards raising the competence and productivity of scientists throughout the system. To this end, it should use professional excellence and financial support as principal means of program guidance. We believe that PARC has adequate tools to encourage a collaborative research effort, e.g., supplementary support, mentorship, formal collaborative programs, and research support activities. It should use great care to select top provincial as well as federal scientists to serve on its boards and committees. It should promote and support provincial leadership of research activities for which the provinces are qualified, while avoiding preemption of this responsibility.

Part of this process of integrating the system consists of finding a precise role for NARC that supports provincial research without competing with it. NARC should not be doing research that can be done by decentralized institutions. It should become a mentor organization whose worth is measured by the success of those it tutors. As a national center, it can provide real economies of scale in the collection and distribution of germplasm, in

providing databases and other scientific information, in arranging coordinated programs of mutual interest to multiple research institutes, in maintaining a database of research in progress, in equipment maintenance and provision of spare parts, and in facilitating international scientific interchange.

Assuring adequate resources. The GOP has appropriated Rs 569 million for agricultural research at federal level for the fiscal year 1992/93, an increase of more than 180 percent over the Rs 203 million average of the prior two fiscal years. The GOP has also provided another allocation of Rs 200 million for the year 1992/93 under the Productivity Enhancement Programme (PEP), a level which exceeds that formerly provided by donor agencies. The system is fully sustainable in terms of its financial resources, and is strengthened by the GOP's prompt assumption of direct responsibility for its support.

The Pakistan agricultural research system needs other resources, not all of which can be readily supplied by the GOP. Sophisticated scientific equipment and spares, for example, must be acquired abroad with scarce foreign exchange. Pakistan education institutions are now awarding doctorates, but products of both national and international training claim that international training offers an additional level of sophistication. Some institutions, notably SAU, are now experimenting with joint doctoral degrees involving training and research conducted at home and abroad. This arrangement provides significant economies while assuring maximum benefits to Pakistan in research and training.

The research system has suffered at all levels from its inability to establish and maintain priorities by funding allocation. Establishment costs have exceeded those for operations, reducing research efficiency and productivity. Pakistan has relied on donor assistance to make up the shortfall in investment and operating funds. New programs have been financed by donors with non-recurring contributions, creating an unfunded obligation.

PARC has dealt with the first problem by creating the Productivity Enhancement Programme, which provides additional operating funds to selected activities to improve their productivity. This is an excellent program, if it can be maintained, since it allocates funds where they are most needed and useful.

Providing sustainability of concept. The MART project introduced a number of facilities intended to strengthen perceived weaknesses in the national agricultural research system. Among these were international training, buildings, laboratory equipment, computers, audio-visual equipment, modern library equipment and databases, and pilot (demonstration) activities such as farming systems research, provincial agricultural communications support cells, and the agribusiness relations support cell. Each facility not only represents resources, but reflects a concept of how to meet a need of the system. The fact that the resources have been spent does not mean that the concept has terminated. For example, training more than benefiting an individual, strengthens the excellence of the system. Sustainability of the training concept requires continuing attention to optimal utilization and spread of the training received, so that the entire system benefits.

The library facilities are immediately useful to scientists, but must be maintained and updated periodically if they are to retain their utility. Laboratory equipment and computers are not just tools needed to perform traditional experiments at existing levels, but enable a scientist to perform more effective research, and stimulate the need for better science and more sophisticated tools. While the equipment needs to be maintained, the embodied concept is a continued pursuit of excellence. Similarly, maintenance, adaptation, and spread of the concepts included in pilot activities are ultimately more important to the issue of sustainability than continued financing of the pilot activity itself.

This vision of facilities as concept is shared by a few Pakistani scientists at all levels. However, it needs to be nurtured to continue to optimize utilizing facilities which were provided by MART. Individual pieces of equipment or an advanced degree awarded to a participant are less important to the institution than the continued pursuit of ways to utilize equipment and training to improve the research system. Only the future will demonstrate that this vision has been internalized.

Encouraging scientific excellence. The 25-year USAID program of assistance to Pakistan agricultural research had as underlying objective of fostering good science as an open, international collaboration. This has been a key feature of U.S. international scientific liaison for more than five decades. It has been institutionalized in the underwriting by the U.S. of 25 percent of the CGIAR budget for International Agricultural Research Centers. A number of centrally funded AID projects, including the NAS/BOSTID program and multiple Collaborative Research Support Programs (CRSPs) are directed at establishing and maintaining collaborative research among international scientists. Pakistani students have established links with individual scientists and their institutions which may eventually become formalized in joint degree programs or joint research activities.

International training and specialized technical assistance provided by MART supported the operations of IARCs such as CIMMYT and ICARDA. These and similar donor programs provide a natural link with the international scientific community, and have enabled individual scientists as well as Pakistan agriculture to benefit from expertise not otherwise available. Pakistan will continue to participate in these IARC programs, but not at the level permitted with MART funding.

International collaboration between U.S. and Pakistani scientists may thus be expected to continue under various forms. What is lost by cessation of assistance is the facilitation of these forms, and the encouragement by the staff of a foreign donor located in Pakistan. Sustainability without that particular foreign contribution will depend, like all other issues, on the capacity and desire of the Pakistani scientists and their organizations.

Effects of donor withdrawal. Cessation of U.S. assistance to Pakistan will be practically coterminous with the MART project PACD. Although AID had hoped to continue collaboration with the Pakistan agricultural research system, further assistance was by no means assured. AID continuously reviews its priorities for funding, and institutional development of agricultural research systems is not now among them.

The loss of AID funding for Pakistan agricultural research is being offset by the World Bank's \$80 million Second Agricultural Research Project (ARP-II). This project's main objectives are:

- a. Improve and strengthen research capabilities in the provinces
- b. Consolidate and complement the advances achieved under ARP-I at the federal level, that is, with PARC and NARC;
- c. Support high priority research programs at the federal and provincial levels;
- d. Improve and strengthen research/extension linkages; and
- e. Strengthen linkages with eminent overseas research institutes.

Inputs to be financed include training, technical assistance, equipment and machinery, vehicles, operating costs, and staff costs. It thus appears that this activity will render the same general types of continuing assistance as might have been anticipated from AID, but at higher levels.

A noteworthy development is the solicitation by provinces of foreign assistance for improving their agricultural systems, either as a stand alone activity or as a part of a national program. ARP-II allocates some of its assistance funds for individual provinces without intervening allocation by PARC.

C3. Conclusions

The federated research system is established and operating. While far from perfect, it will continue to improve its output and productivity if provided with adequate resources. The GOP is supplying significantly increased funding for agricultural research, which if effectively allocated, should improve research efficiency. One cannot be sure that all pilot activities initiated under MART (e.g., FSR) will or should be continued. The innovative Productivity Enhancement Programme (PEP), which concentrates additional operating funds on priority programs, is an excellent way to define and assure funding of priority activities, and should be institutionalized.

The GOP has provided funding that should be adequate to continue the federated agricultural research system for the immediate future. It has demonstrated (through the PEP) the ability to find an innovative way to provide supplementary funds for priority programs. Considerable uncertainty still exists about how research priorities are set, and the future funding of projects initiated on a pilot basis with donor support. The high foreign exchange cost of international collaboration is a serious obstacle to the sustainability of international scientific linkages, which will need to be covered through foreign donors or loans. The tendency towards provincialism can also become a serious barrier to cooperation in the national research system. PARC's leadership is needed to raise the scientific levels of all parts of the system, and encourage the interchange needed to offset institutional inbreeding.

D. Validity of the Development Paradigm

D1. The Current Paradigm

The general donor paradigm for assistance to development of the Pakistan agricultural research system guided that assistance through the MART project. It was a traditional public sector institution strengthening approach, which sought to create an integrated federal system with strong central leadership. Donors encouraged the formation of a Pakistan Agricultural Research Council and then supported its autonomy. When PARC decided to create the National Agricultural Research Center as a lead institution, donors provided its physical facilities.

The development model sought to establish a critical mass of qualified scientists in all parts of the system through postgraduate training. It supported non-degree and in-country training of these and other scientists, and arranged for long-term and consultants' advisory services. It also supported the work of the system by providing laboratory and other equipment. As the system developed, the institutional strengthening interest underwent something of a shift, turning more towards management of the system, seeking efficiency, effectiveness, and utility. Accounting systems were computerized, and library services were upgraded and modernized with CD-ROM equipment and databases. Development of research master plans was supported, and pilot activities were financed in FSR, communications, and agribusiness relations.

As the MART project draws to a close, two major changes in direction in the PARC development model have already taken place. First, the amended MART project concentrated on major institutions and limited programs. USAID has tried to manage this focus through introducing concepts of strategic planning, client-responsive research, and promotion of collaboration with agribusiness as well as producers. Second, as the GOP assumes full responsibility for financing agricultural research, the chairman has obtained additional resources and liberalized their use, decentralizing responsibility for performance. These concepts need time to work themselves into the system and evolve *in situ*. PARC needs to assess the various pilot activities introduced under MART, with a view to expanding those which are most useful.

D2. Conclusions

A significant change in the development model began with the amended MART project, and has been accelerated by the pending cessation of U.S. assistance, a generous GOP financial response, and decentralization and liberalization of the use of these funds for conducting scientific programs. The process of institutional development is evolutionary; these changes need time to become absorbed and institutionalized.

The GOP and PARC are almost totally in charge of MART-supported activities, receiving only residual financial assistance. In the meantime, the WB ARP-II program provides an expanded level of funding (\$82 million) to programs managed by national and

provincial authorities. This assumption of full control and responsibility by the national system, even with donor support, is the ultimate paradigm shift.

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SECTION IV

RECOMMENDATIONS

SECTION IV RECOMMENDATIONS

A. Preface

PARC, USAID, contractors, the federal and provincial institutions, and the scientists are commended for their dedication, quantity and quality of inputs, performance and reporting on the MART project. The progress in further developing an effective national agricultural research network during the life of the project is noteworthy and should be highly appreciated by the Government of Pakistan. The evaluation team applauds those involved in the project and strongly recommends continued support and attention to the further development of the network to meet the food and fiber needs of a rapidly growing population.

The Pakistan agricultural research system is established, operating, and producing useful research. The GOP has moved rapidly to assure increased funding, focusing the increase on selected activities to increase research productivity, and has liberated scientific creativity by delegating management responsibility to program leaders. World Bank funding of research assures continuing foreign exchange for training, technical assistance, and commodities. The agricultural research system, while not perfect, will be sustained and improved.

Our recommendations both to USAID and to PARC reflect the evaluation team's concern that the agricultural research system be sustained and improved with no loss in momentum. In our judgment, the most important critical elements of sustainability in the MART project involve:

- Maintaining the integrity of the agricultural research system
- Assuring that the system has adequate amounts of appropriate resources
- Providing for continuity and refinement of concepts
- Encouraging responsiveness to client needs
- Encouraging scientific excellence throughout the system

Of these, encouraging excellence is the most crucial. The national agricultural research system is now well equipped, as are most of the provincial institutions. A major task is to assure maintenance of equipment and continued improvement of staff. Encouraging, demanding and rewarding excellence in research and development is perhaps PARC's most exciting challenge as the leader of the national network. Persons from outside can make suggestions in this regard, but encouragement, demands and rewards must be carried out within the Pakistan culture. PARC must face the challenge.

B. Lessons Learned

The most significant lessons learned had to do with improving the realism of program expectations relative to resource, time, and political constraints. The centerpiece of the MART project was management, yet management of research received far less attention than technological aspects. Perhaps efforts were focused on the wrong constraints, or administrators and advisors alike were disheartened by the difficulty of securing major changes in government rules, regulations, and procedures. This was too much to expect, particularly given the stable levels of funding to the system.

B1. The Effect of Operating Fund Constraints

Improved management within a highly structured system is generally improved *at the margin* when additional resources reward better planning, execution and implementation of research. It means stretching the system to its limits in areas of rigidity. This requires liberation of the creative energy of scientists, with appropriate recognition *and resources* for innovation and excellence. There is encouraging evidence that PARC's top management is committed to such a course, but the concept has not yet prevailed throughout the system. Continued stress on enabling scientists to perform will bring about significant improvements at the margin without requiring major changes in overall government regulations and procedures.

B2. The Effect of Political Constraints

The difficulty of effecting changes in the management of a large research program conducted by geographically dispersed entities in a federated system, while recognized, was inadequately addressed. PARC's role is primarily coordinative and supportive; it does not command. This requires development of consensus in a system where participants are accustomed to seeing resource allocation as a zero-sum game. Change does occur, but slowly and with greater effort than anticipated. In retrospect, while the commodities distributed through PARC were and will continue to be useful, they may have been less of an incentive to system integration than, say, an equivalent amount of operating funds.

PARC management is well aware of its role in leadership and coordination in relation to the provincial institutions. However, this role is so important for the continued development of the national agricultural research network that the evaluation team thought it appropriate to note as an area for high priority attention.

B3. The Effect of Time Constraints

The critical nature of time lags becomes apparent when a long term program nears completion with little probability of being extended. Half of the long term participants will not return to the project in time to contribute to its purpose during LOP. The last tranche of commodities (primarily computers, databases, and audio-visual equipment), while invaluable for future productivity, will not materially impact research output in the next year.

The benefits of these and other MART contributions will continue to permeate the research system, so their impact is not lost, just delayed. In our recommendations to PARC, we have placed considerable emphasis on the need to nurture these delayed inputs in order to maximize this impact.

C. Recommendation for USAID

The USAID project officer has prepared a program for phase-out of the MART project which will continue ongoing activities with primary attention to strategic planning and agribusiness relations. This approach is a well thought-out plan to which most remaining funds are committed. The evaluation team therefore has a single recommendation for USAID:

- Identify and promote innovative ways in which international scientific linkages—particularly among Pakistani and U.S. scientists, educators, and businesses—can be fostered and sustained in the post-Mission period.

There are opportunities for international scientific linkages (e.g. joint doctoral programs, involvement of IARCs and CRSPs) that require minimum funding to pay large dividends, and USAID funds for such programs must come from a non-mission source. They will not be forthcoming unless the Islamabad mission describes the program, justifies the need, and persists in its advocacy.

D. Recommendations for PARC

The following recommendations to the Pakistan Agricultural Research Council reflect the concerns with which PARC will have to struggle in the years ahead.

D1. Research Planning

The planning process recommended by the evaluation team is set forth in Chapter I A. It is the observation and conclusion of the team that several important steps have been by-passed in the planning process to date at the federal and provincial level. It is recommended that PARC review this process and ascertain what, if any, steps were overlooked in the planning process at either the federal or provincial level and take corrective action, if required.

D2. The NARC Master Plan

The evaluation team believes that the Master Plan 1988-2000 lists more priorities than can be managed with available resources. Further, the team suggests that some of research activities included in the plan should be the responsibility of provincial agricultural research. PARC, NARC, and selected scientists from provincial institutions should again review the Master Plan to assure optimization of resource use and complementarity between NARC and the provincial institutions and to consider adding a section on monitoring and evaluation to the Master Plan.

D3. Research-Extension Collaboration

Only a limited review of extension activities was carried out as a part of the present evaluation. However, the impression gained from considerable discussion with research staff was that collaboration with extension takes place, for the most part, in dissemination of research results. Collaboration in problem identification did not seem to be evident. The extension service has a well established infrastructure, is reported to have adequate mobility and other facilities and a staff with scope for broader responsibility. It is recommended that research and extension have a greater interface throughout the process of problem identification, research planning, verification of research results, and dissemination.

D4. Farming Systems Program

Significant issues must be addressed in looking to the future of the farming systems program, particularly the questions of necessity and sustainability. The evaluation team recommends that PARC and leaders of the provincial institutions in the research network carefully appraise the program and determine whether it is a necessary element. The preliminary view of the evaluation team is that it may not be.

D5. AZRI/ICARDA

An issue that needs to be resolved is the geographic mandate of AZRI. As a federal institute it has sub-stations in the Sindh, the Punjab and the Northwest Frontier Province, but does not have the human and financial resources to support research work at these sub-stations. We recommend that PARC review the situation and determine whether a change in the geographic mandate is desirable or possible. We further recommend that the very productive relationship between AZRI and ICARDA be continued for the foreseeable future.

D6. Private Sector Relationships

The team's perception is that very little progress has been made in gaining support from the private sector or in cooperation with it. Although some 20 agreements have been completed between PARC and agribusiness enterprises, there is little to show for it. The team's recommendation is for more intense effort directed at a higher level than the case to date to see if significant involvement and support can be achieved during the balance of the project.

D7. Maintaining International Linkages

Pakistan has a long history of excellent linkage with the international agricultural research institutes in the CGIAR system, which no doubt will continue. The challenge for PARC and the provincial institutions is to develop lasting and meaningful relationships with universities in a number of developed countries for scientific exchange and specialized postgraduate training. The present BOSTID program is a good example to pursue. PARC needs to explore many different means through donor assistance, bilateral agreements, and direct contact with scientists and institutions to further develop and maintain these linkages.

D8. Financing Agricultural Research

Assuring adequate financing for agricultural research is a common problem throughout the world, so numerous well-known formulae exist as guides to the level of funding required. Pakistan has a good start in securing funding from both national and international sources. Both sources are generally responsive to highly productive research whose benefits are well documented and presented in well illustrated form to policy makers, cabinet level officials, and the general public. PARC should take a more active role in such presentations, to help assure continued and increased support in the future.

D9. Equipment and Facilities

Under the MART project, scientific equipment and computers were provided to federal and provincial institutions in the project. Most of the equipment is productive, but some has been lying unused for several years because it is inappropriate or parts were missing on delivery. This small issue is in danger of giving the total project a bad name, especially since it has been pending for almost four years. PARC should withdraw all unused equipment, repair what is possible, reassign it to those who are able to use it, and get that which is unusable off the books.

D10. Information Transfer

The national agricultural research system now has facilities for multi-media production and the potential to enhance the transfer of technology. It is the view of the evaluation team that the quality of the products will need to be substantially improved before any major impact can be expected. To achieve this, additional training for PACSC staff in script writing, editing, production and quality control in the NARC AVC unit is recommended.

D11. Continuance of Selected Project Elements

A number of the pilot activities sponsored by MART are still at an early stage of development. In the view of the evaluation team, the following are among the most important of these efforts in terms of their potential utility.

- **Library technology:** Seventeen libraries were provided with CD ROM readers and databases, microfiche back files of scientific publications, with readers, printers, and photocopiers. Annual updating of the databases, maintenance of this equipment, and training of staff is essential to its use to improve research productivity.
- **Training institute:** a central unit is established, equipped, and operating, with a significant track record in training staff throughout the system. This is one of management's most effective tools in improving system excellence. The training staff should have a high priority for future training in order to maintain this competence.

- **Agribusiness relations:** a recently established national agribusiness relations cell is facilitating joint research-agribusiness partnerships. Recommendation D6, above, is directed at strengthening this cell. If successfully implemented, we hope that this will lead to establishing similar provincial units, all with substantial cooperation.
- **LEMUR:** a laboratory equipment maintenance and repair unit is in operation and equipped with a supply of spares. It is essential that this be replicated in each of the provinces in order to ensure continued operation of laboratory equipment.

ANNEX A

**STATEMENT OF WORK FOR SECOND MIDTERM EVALUATION OF
MART PROJECT**

ATTACHMENT 1
STATEMENT OF WORK
FOR

MANAGEMENT OF AGRICULTURAL
RESEARCH
AND
TECHNOLOGY
(MART)
PROJECT

BACKGROUND

The MART Project is the Mission's capstone activity with public sector agricultural research bringing to a close over 20 years of assistance in creating, developing and maturing a responsive, dynamic and collaborative agricultural technology development and dissemination institution. The MART Project was approved by USAID in 1984 as a five-year, \$30 million grant project. The Project was later amended to increase life of project funding by \$8 million to a total of \$38 million and August 7, 1994 was set as the new Project Assistance Completion Date. The funding, however, was reduced by \$5 million in 1991 due to the restrictions placed on Pakistan by the Pressler Amendment.

The MART Project was originally designed to strengthen the performance of the national agricultural research system. However, as determined by the project evaluation in 1989, the project purpose was believed to be too broad and, accordingly, resulted in an inadequate response to the critical problems and constraints faced by Pakistan's research institutions. In addition, it was determined that the public sector needed encouragement and experience to foster linkages and collaboration with Pakistan's emerging, private agribusiness sector. Therefore, the Project was modified to focus on: ensuring the responsiveness of research to client demands, developing usable technologies to address recognized problems; and ensuring dissemination of research results to important user groups such as agribusinesses and input manufacturers which are, in their own right, potential and effective disseminators.

Concomitant to this focus on research relevance is a narrower institutional focus. Under the amendment, nine participating research institutions become the target of USAID assistance.

rather than the entire research system's universe of 250 Institutions outlined in the original project. The nine Institutions are: Pakistan Agricultural Research Council (PARC); National Agricultural Research Centre (NARC); Arid Zone Research Institute (AZRI); University of Agriculture, Faisalabad (UAF); Ayub Agricultural Research Institute (AARI), Faisalabad; Agricultural Research Institute (ARI), Srialab; NWFP Agricultural University (NWFP AU), Peshawar, Sind Agricultural University (SAU), Tandojam; and Agricultural Research Institute (ARI) Tandojam.

MART has undertaken to strengthen the national agricultural research system through the supply of laboratory and field equipment, computer systems, foreign and in-country training, and expatriate and local technical assistance. An Audio-Visual and Training Center was built at NARC and audio-visual equipment was supplied to the federal and provincial agricultural communication support cells. PARC has established a National Farming Systems Research Coordinating Unit and a Directorate of Agri-Business Relations, both supported by MART. In addition, MART is funding a \$3 million grant program to research critical problems affecting the productivity of stressed agricultural lands.

The participating research institutes are now equipped in terms of trained manpower and facilities to plan and execute research and dissemination programs. However, it is felt that at present the research managers lack the strategic planning skills to tailor their programs to meet the research needs of the country. The Mission is of the view that by making judicious use of available GOP budgets, proper management of existing research infrastructure, and establishment of effective linkages with the country's agricultural extension system and the private agribusiness sector, these institutes can make a major impact on agricultural productivity on a sustainable basis. USAID/MART Project management has already taken several initiatives with the senior GOP management of these institutions. As a result of these initiatives, the GOP research managers have started a realistic analysis and redesign of their activities with respect to allocation of funds, transfer of personnel, creation of a cadre of junior level research managers

STATEMENT OF WORK

The MART Project can be viewed from the perspective of being at the beginning of the third developmental phase. To this end, Phase I covered construction, equipment and training; Phase II embodied consolidation and operational adjustments to the research system; Phase III focuses on management for sustainable research within the GOP support levels.

This evaluation will focus primarily on implementation of Phase II and III activities and will be concerned with how the amended project is progressing toward achievement of the amended purpose. The evaluation will determine what major constraints presently exist and recommend how these may be overcome to help achieve the desired objectives by the PACD. Solutions to agricultural research problems, and management thereof, in the 21st century will require the application of innovative ideas and approaches. Therefore, there is an urgent need to examine the existing paradigms which frame our developmental approaches to see if these are still guiding us towards effective solutions.

The focus of this evaluation is to be on the management aspects of MART and shall include but not necessarily be limited to the areas listed below:

1. A review and evaluation of the participating research institutions with a view to document the following:
 - i. Competency of the research managers in strategic planning - are they able to identify and solve problems in a cost-effective way and how do they interpret the value of long term strategic planning to meet national priorities. Such analysis shall include whether or not enough emphasis has been placed on training of research managers in planning and coordination of planning activities;
 - ii. Adequacy of research and dissemination plans and how the GOP is using the federal/provincial master plans, as developed through MART, for planning of agricultural research;
 - iii. Adequacy and effectiveness of the scientific staff and research infrastructure, i.e. laboratory and field equipment and plans to maintain and up-grade;
 - iv. The extent and effectiveness of linkages with the extension system and the private agribusiness sector;
 - v. Views of the research managers regarding strong and weak aspects of the MART Project in the development of their respective institutions; and ,
 - vi. Possible areas and ways the MART Project can assist the research managers in attaining sustainable levels of accomplishments before USAID support is phased out.

2. An assessment of the GOP view of the MART Project and its elements in both general and specific terms. This area of investigation shall focus on gaining a broad geographical and administrative cross section of responses from those who have a direct stake in the system. The array of respondents shall include scientists, research managers

and GOP administrators at the federal and provincial levels. Implied here is how we as development specialists are listening or perceiving what the agricultural research system is telling us other than the obvious, i.e. unobtrusive evidence of successes or failures.

3. Determination of the extent the technical assistance teams (Winrock International, ICARDA and BUSTID) have met their goals when measured against the terms of reference defined in their respective contracts. This includes assessment of the effectiveness of the teams in developing the participating research institutes into sustainable organizations which cannot only survive on their own but also serve as a model for other components of the national agricultural research system.
4. A quantitative assessment of the extent project objectives envisaged in the Project Amendment have been met as measured against the Project's inputs and outputs.
5. An assessment of the extent to which gender concerns have been addressed by the project. The following issues shall be included in this assessment:
 - i. How were the interests and role of women taken into account in each of the design, appraisal and implementation stages of the project? In what ways did women participate in these processes?
 - ii. What were the effects, positive or negative, of the project concerning women's access to income, education and training, and with respect to workloads, role in household and community, and health conditions? How were the interests and role of women taken into account in the previous evaluations? Were significant factors concerning women overlooked at the appraisal stage?
 - iii. Were gender-specific data available for each of project stages, i.e. design, appraisal, implementation, monitoring, evaluation?
 - iv. How did women's integration in USAID activities affect the sustainability of

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project outcomes? Were outcomes more sustained (or less sustained) when women were taken into account in USAID activities? Are the results achieved by the project equally sustainable between men and women beneficiaries?

6. Assessment of the contributions and effectiveness of the key players (Pakistan Agricultural Research Council, National Agricultural Research Center, Agricultural Research Division, USAID and the technical assistance teams) in the institutionalization of programs and linkages to provide long term sustainability to key project elements of Farming Systems Research, Audio-Visual Information Transfer, Training, and Agri-Business Relations. This is also to include a qualitative analysis of possible impact of any discontinuation of funding by donors and lack of priority setting by the GOP on agricultural research.
7. Exploration of the current "paradigm" that embodies the objectives and methodologies associated with the USAID/GOP approach to the MART Project with the purpose of determining if it is time for a paradigm shift as related to development aid in support of agricultural research. Does the current paradigm allow for accurate perception of research program problems and identification of appropriate solutions?
8. An analysis of the research capacity that MART will leave behind for continued and enhanced performance of the agricultural research system.

Based on the findings of the evaluation, the team shall present its conclusions and propose corrective measures and adjustments that should be considered for implementation over the remaining period of the project. This information will aid the Mission in making decisions relative to phase out, and will assist other donors in focusing their efforts. While making its recommendations, the Evaluation Team shall keep in view the fact that additional USAID project assistance will not be available because of the restrictions of the Pressler Amendment.

V. METHODS AND PROCEDURES

On arrival in Islamabad, the team shall spend approximately 2 days for purposes of in-country orientation, review of project documentation and finalization of evaluation work plan. The host country team member will, in advance of arrival of the expatriate team members, liaise with host country counterparts and develop initial in-country contacts and travel plans. The expatriate team members will be allowed a maximum of one day in AID/Washington or at the consulting firm headquarters for purposes of consultation and orientation to the MART Project.

The Evaluation Team shall visit each of the 9 participating federal and provincial institutions. Evaluation methods shall include reviewing secondary source data as well as collection of primary source data through interviews and field visits. The Evaluation Team is required to use an approach that blends its qualitative review with substantive quantitative data to support the findings and conclusions.

Recommendations developed by the Evaluation Team must be ACTIONABLE within the scope of a) current funding levels and the PACD of MART; and b) GOP funding levels, to include a projected 20% increase in GOP research funds over the next 3 years. This evaluation must analyze and present findings to address senior management questions, concerns and interests. The audience for this evaluation are the management officers of GOP and USAID.

VI. COMPOSITION OF EVALUATION TEAM

Contractor shall provide an Evaluation Team consisting of three members, two expatriates and one from Pakistan. USAID/Islamabad will assist the Contractor in the identification and approval of the host country team member. The team must be reflective of multidisciplinary orientation both at the individual and team levels. This means that the experiences of the

members must include a team oriented approach in program/project analysis and preparation of actionable recommendations directed toward senior decision makers.

One expatriate team member shall be designated as a team leader with full responsibility for coordinating the evaluation and the drafting and presenting of the final evaluation report. The following qualification requirements apply to all team members:

MS or Ph. D. degree in international agricultural development/technology transfer underpinned with strong multidisciplinary training and at least 15 years experience in the following areas:

- i. At least 5 years management experience of public/private agricultural research station or agricultural extension department;
- ii. Three to five years of senior leadership experience in international development, preferably in Pakistan, in the area of agricultural research, farming systems, research planning and administration, agribusiness development and team management;
- iii. Must have demonstrated multiple project knowledge of strategic planning methodologies for research system design and priority setting, and monitoring and evaluation of regional and national level programs; and,
- iv. Must have working knowledge of the processes related to identification of a research/scientific paradigm, its component parts, association with scientific research programs, definition of research priorities and requirements for generating a "paradigm shift", as is currently being widely adopted internationally by the senior managements of leading private enterprises.

At least one team member should have three to five years experience in private agribusiness management.

VII. REPORTING REQUIREMENTS

The final report shall consist of the following sections:

1. Basic Project Identification Sheet.
2. Executive Summary of no more than three single spaced pages. Executive Summary to discuss current operational environment, projection of future trends and outline of major actionable recommendations. A suggested format for this section will be provided to the team by USAID/Pakistan.
3. Main body of the report shall include the analysis of topics covered under ARTICLES II AND IV of this Statement of Work with supporting graphics and tables.
4. A concluding section which includes actionable recommendations of the evaluation as developed from the perspective of research management innovations, private sector initiatives and requirements for long term sustainability. This section shall also include a narrative on lessons learned.
5. A set of annexes that include at a minimum the evaluation scope of work, a listing of individuals and documents consulted and a completed evaluation summary in the format provided by USAID/Washington.

The contents of the report shall distinguish clearly between the descriptive information underpinning the evaluation team's findings, interpretative information leading to conclusions and the team's recommendations for possible modifications and further actions which stem from the conclusions.

The Evaluation Team will present its findings to senior GO² and USAID managements. The

Team will distribute copies of the draft evaluation report at least 2 working days before the presentation. Completion of the near final report (one which has been revised at least once based on Mission/GOP review) shall be required before departure of the evaluation team. Twenty five copies of the final report shall be submitted to USAID/Islamabad for distribution to the concerned agencies no more than six weeks after the evaluation team has left Pakistan.

VIII. EVALUATION TIME FRAME

The effective date of this delivery order is January 4, 1993 and the estimated completion date is March 20, 1993. All team members will be recruited for a period of 25 workdays except for the Team Leader who will be required to work for 28 workdays to enable him to finalize the evaluation report. The team will be required to work 6 days a week and on holidays.

ANNEX B

PERSONS INTERVIEWED

ANNEX B
PERSONS INTERVIEWED

At Chemonics/Washington

Ray Carpenter, Winrock International Project Officer
Roger Bloom, Project Technical Support Officer

Islamabad

PARC

Zafar Altaf, Chairman, PARC
Abdul Sattar Alvi, Project Secretary, MART
Muhammad Kamal, Scientific Officer, MART
Sanna Ullah Khan, DD/Training, PARC
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Shahid Rafique, Chief of Livestock Division
Sarwat Mirza, Chief of Range Management Division
Anwar Khan, Chief of Germplasm and Genetics Division
Euan F. Thomson, Chief of Party, ICARDA
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Zulfiqar, Dairy Extension Officer

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Syed Kamran Hussein, Plant Manager
Sabir Ali, Laboratory Technology
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ANNEX C

DOCUMENTATION REVIEWED

ANNEX C
DOCUMENTATION REVIEWED

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ANNEX D

PROJECT EVALUATION SUMMARY

ANNEX D
PROJECT EVALUATION SUMMARY
(Suggested Draft Narrative)

E. ACTION DECISION

"Identify and promote innovative ways in which international scientific linkages, particularly between Pakistani and U.S. scientists, educators, and business, can be fostered and sustained in the post-Mission period." Action to be assigned to Mission Management.

H. EVALUATION ABSTRACT

The amended MART project seeks to strengthen the Pakistan agricultural research system, a federation of national and provincial research institutes and universities, by (1) insuring research responsiveness to the needs of farmers and agribusiness; (2) development of relevant technology; and (3) dissemination of research technology. The subcomponents facilitate interaction with farmers and agribusiness.

Application of the Pressler Amendment reduced authorized funding by 13 percent, and follow-on activities are not planned. Remaining project resources are earmarked for activities which facilitate orderly termination of U.S. assistance. The evaluation focused on post-AID sustainability of MART objectives.

The Pakistan agricultural research system is established, operating, and producing useful research. The GOP has moved rapidly to assure increased funding, focusing the increase on selected activities to increase research productivity, and has liberated scientific creativity by delegation of management responsibility to program leaders. World Bank funding of research assures continuing foreign exchange for training, technical assistance, and commodities. The agricultural research system, while not perfect, will be sustained and improved.

A single recommendation to USAID requests attention to innovative means for facilitating continued U.S.-Pakistan interaction in science and education following withdrawal of the Mission. Fifteen recommendations to the Pakistan Agricultural Research Council reflect the concerns with which PARC will have to struggle in the years ahead.

J. SUMMARY OF EVALUATION FINDINGS

The amended MART project seeks to strengthen the Pakistan agricultural research system, a federation of national and provincial research institutes and universities, by (1) insuring research responsiveness to the needs of farmers and agribusiness; (2) development of relevant technology; and (3) dissemination of research technology. The subcomponents facilitate interaction with farmers and agribusiness.

Application of the Pressler Amendment reduced authorized funding by 13 percent, and follow-on activities are not planned. Remaining project resources are earmarked for activities which facilitate orderly termination of U.S. assistance. The evaluation focused on post-AID sustainability of MART objectives.

A. Program Evaluation

The basic structure of the Pakistan Agricultural Research System is well-established, and productive. It consists of four provincial research institutes, three provincial universities, a national center (NARC) and at least one outlying federal institute (AZRI), plus a large number of outlying subcenters, field stations, and experimental farms, coordinated by a national research council (PARC). The system is well-staffed with [] professionals, including [] with PhDs or MScs, but there are major disparities in capacity among the various organizations.

Management of agricultural research continues to be a major concern, and we noticed little improvement due to MART interventions. Perhaps this has to do with major constraints about which MART could do little, including traditional administrative practices and the static budget with its growing disparity between establishment costs and operating funds. Both of these constraints are now being resolved, first through a larger budget which expands the establishment: operations ratio, and second, the decentralization of responsibility and authority over these operating funds to the research program directors.

A1. Accomplishments

Major MART accomplishments include a massive institutional strengthening effort which trained more than 80 Pakistani scientists and educators to the Ph.D. or M.Sc. levels and provided non-degree specialization to almost 200 scientists and administrators. MART funded in-country training of almost 5000 persons in 141 short course.

Laboratories throughout the system were upgraded with equipment and computers, and PARC and NARC accounting systems were computerized. Technical assistance from CIMMYT, ICARDA, Winrock International, and BOSTID introduced research strategic planning and management methods and hands-on collaboration.

Besides this more general institutional support MART introduced innovative concepts, installed as coordinated federal:provincial pilot activities, to support research. The following are among the most important of these efforts.

- Library technology: 17 libraries provided with CD ROM readers and data bases, as well as microfiche back files of scientific publications, with readers and printers, and photocopiers
- Communication cells: five provincial agricultural communications support cells equipped and operating, backed by NARC's central audio-visual communications unit.

- **Training institute:** a central unit established, equipped and operating, with a significant track record in training staff throughout the system
- **Farming Systems Research:** A national FSR coordinating office and four provincial units in operation.
- **Agribusiness relations:** a recently established national agribusiness relations cell is facilitating joint research-agribusiness partnerships. It is hoped that this may lead to similar provincial units.
- **LEMUR:** a laboratory equipment maintenance and repair unit is in operation and equipped. It is hoped that this will lead to similar provincial units.
- **Competitive research grants:** This BOSTID-managed effort allocates resources competitively at the margin to the best scientific endeavors, provides superior mentors on how to do science, rewards innovation and stimulates excellence, while improving international scientific linkages.

A2. Sustainability

The Pakistan agricultural research system is established, operating, and producing useful research. The GOP has moved rapidly to assure increased funding, focusing the increase on selected activities to increase research productivity, and has liberated scientific creativity by delegation of management responsibility to program leaders. World Bank funding of research assures continuing foreign exchange for training, technical assistance, and commodities. The agricultural research system, while not perfect, will be sustained and improved.

B. Recommendations

A single recommendation to USAID requests attention to innovative means for facilitating continued U.S.-Pakistan interaction in science and education following withdrawal of the Mission. Fifteen recommendations to the Pakistan Agricultural Research Council reflect the principal concerns with which PARC will have to struggle in the years ahead.

1. Research Planning. It is recommended that PARC review the planning process and ascertain what, if any, steps or procedures were overlooked in the planning process at either the federal or provincial level and take corrective action, if required.

2. The NARC Master Plan. It is recommended that PARC, NARC, and selected scientists from provincial institutions again review the Master Plan to assure optimization of resource use and complementarity between NARC and the provincial institutions and to consider adding a section on monitoring and evaluation to the Master Plan.

3. Research-Extension Collaboration. It is recommended that research and extension have a greater interface throughout the process of problem identification, research planning, verification of research results, and dissemination.

4. Farming Systems Program. The evaluation team recommends that PARC and leaders of the provincial institutions in the research network carefully appraise the program and determine whether it is a necessary element for development.

5. AZRI/ICARDA. It is recommended that PARC review the situation and determine whether a change in the geographic mandate is desirable or possible. It is further recommended that the very productive relationship between AZRI and ICARDA be continued for the foreseeable future.

6. Private Sector Relationships. The team's recommendation is for a more intense effort directed at a higher level than the case to date to see if significant involvement and support can be achieved during the balance of the project.

7. Maintaining International Linkages. PARC needs to explore many different means through donor assistance, bilateral agreements and direct contact with scientists and institutions to further develop and maintain these scientific linkages.

8. Financing Agricultural Research. It is recommended that PARC take a more active role in documenting productive research and presenting it in well-illustrative form to policy makers and the general public, as well as donors.

9. Equipment and Facilities. It is recommended that PARC withdraw all unused equipment, repair what is possible and then reassign it to those who are able to use it and survey that which is unusable and get it off the books.

10. Information Transfer. Additional training for PACSC staff in script writing, editing, production and quality control in the NARC AVC unit is recommended in order to improve the quality of communication products.

11. The Question of Continuance of Selected Project Elements. Pilot activities sponsored by MART which are still at an early stage of development will have to be carefully nurtured and their utility evaluated against their contribution before expansion or retention can be determined.

12. What is to be Maintained? In our judgment, The most important critical elements of sustainability in the MART project have to do with:

- Maintaining the integrity of the ag research system
- Assuring availability of adequate and appropriate resources
- Providing for continuity and refinement of concepts
- Encouraging scientific excellence throughout the system
- Encouraging responsiveness to client needs