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MANAGEMENT OF AGRICULTURAL RESEARCH & TECHNOLOGY PROJECT

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LIST OF ACRONYMS

AARI	Ayub Agricultural Research Institute, Faisalabad, Punjab
ACE	Agricultural Commodities and Equipment
AED	Academy for Educational Development
AERU	Agricultural Economic Research Unit
AID	Agency for International Development
ARD	Agriculture and Rural Development Office of USAID
ARDO	Agricultural and Rural Development Office
ARI	Agricultural Research Institute
ARI/Sariab	Agricultural Research Institute, Sariab, Balochistan
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-11	World Bank Second Agricultural Research Project
AVC	Directorate of Audiovisual Communications
AVCTI	Audiovisual Center and Training Institute
AZRI	Arid Zone Research Institute
BARD	Barani Agricultural Research and Development Program, CIDA
BOSTID	Board of Science and Technology for International Development
BPS	Basic Pay Scale
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 of disbursement
CRSP	Collaborative Research Support Program
DD	Deputy Director
DG	Director General
EOT	End of Tour Report
FSR	Farming System Research
GDP	Gross Domestic Product
GOP	Government of Pakistan
IARC	International Agricultural Research Center
ICARDA	International Center for Agricultural Research in Dry Areas, Syria
IIMI	International Institute for Management of Irrigation
IT	Information Transfer (Project Component)
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
NCRP	National Coordinated Research Program
NILTA	National and International Liaison Training and Technical Assistance
NWFP	North West Frontier Province
NWFP AU	NWFP Agricultural University
PACD	Project Assistance Completion Date
PACSC	Provincial Agricultural Communication Support Cell
PARC	Pakistan Agricultural Research Council
PC-1	Official GOP Document Similar to USAID's PP
PEP	Productivity Enhancement Program
PIL	Project Implementation Letter
PITC	Provincial Information Transfer Committee
PP	Project Paper
ProAg	Project Agreement
PROS	Provincial Research Operation Support (Project Component)
RFP	Request for Proposal
RMA	Research Management and Administration (Project Component)
Rs	Rupees, Pakistani monetary unit
SAU	Sindh Agriculture University
ST	Short-Term
TA	Technical Assistance
TARN	Training for the Agricultural Research Network
TI	Training Institute
TITC	Technical Information Transfer Committee
TIPAN	Transformation and Integration of the Provincial Agricultural Network project, USAID
TOEFL	Test of English as a Foreign Language
UAF	University of Agriculture Faisalabad
UNDP	United Nations Development Program
USAID	United State Agency for International Development
USG	United States Government
WB	World Bank
WID	Women in Development
WMCP	Wheat and Maize Coordinated Programs (Project Component)

SUMMARY

The MART Project, USAID's capstone project to a long, fruitful history of assistance to Pakistan's agricultural research system, was designed in 1983 and initiated in 1984. The Winrock component, which began in July, 1986, had four main activities: To assist in improving the management of research throughout the Federal and Provincial research system, to help establish a National Farming Systems Research program, to help create a capacity to produce radio and TV modules and a national communications network for better information transfer, and to help PARC to improve the management of its training activities.

The project has been more successful in accomplishing its goals in some of these activities than in others; the more straightforward areas (FSR and Information Transfer) were more successful than the areas dealing with management (Research Management and Administration and Training for the Agricultural Research Network).

In research management there has been considerable accomplishment, but many project activities have been only partly successful, largely because recommendations made by study teams and reviewers have not been implemented. In the first category a modern, computerized accounting system has been installed at PARC Headquarters and, more recently, at NARC. In the latter category the NARC Master Plan, finalized in 1990, has not been adopted and implemented. There has been more success in the RMA component in the Federal research organization than in the Provinces probably because of the difficulty in changing provincial rules and regulations and because provincial research managers do not believe changes can be made. A change in strategy for implementing the project, changes in Federal and Provincial governments, shifts in key personnel, the 1991 Gulf War and its aftermath, and security conditions (especially in Sindh) have hindered project implementation.

Possibly the Information Transfer component has been the most successful Winrock effort in the MART Project. This is because the component was the most straightforward element and because highly qualified personnel were involved. A modern, national audiovisual production facility has been built, equipped and partly staffed. High quality radio and video programs are beginning to be produced. Agricultural Communication Support Cells have been created and equipped in each province. Technical Information Transfer Committees exist at the national and provincial levels that, if revitalized and strengthened, will be a national agricultural communications network.

Today there is a national FSR program in action. There is a national coordinating cell at NARC; FSR staff are in place in each province who have received much training in FSR principles and methodology; research is being conducted in farmer's field; there is a small but active women's component; and increasingly stronger efforts are being made to transfer FSR findings to farmers and agribusinessmen. Now, the FSR program needs to be institutionalized by appointing full-time and part-time staff, establishing non-development budgets, expanding FSR methodologies to other applied research, and introducing FSR principles and methodology into university curricula.

The NARC Training Institute is much stronger now than it was in 1986. It has excellent, new facilities and equipment, including computer training laboratories. Its curriculum is focussed on helping scientists learn new skills and to keep abreast of new developments. The Institute is offering training on many subjects to audiences from across the country at NARC and in provincial locations. Though few in number the staff are able and motivated. However, as of August, 1993, there was no full-time Director; the Director of Scientific Information held the post as an additional change.

The PARC Directorate of Training (now labeled NILTA, National and International Liaison and Training Assistance) has the capacity to oversee the selection of students for overseas assignments and their approval by GOP. A computerized database on students has been established. Some elements of the re-entry program have been implemented, but a stronger effort is needed to improve this part of the Directorate.

Three project accomplishments were not envisaged in the Project Paper. Those were (1) a major effort to strengthen the agricultural libraries of Pakistan, and (2) procurement of 270 computers for the national research system and (3) a textbook publishing project. All three were funded by USAID but not from the MART Project.

Winrock's component of the MART Project ended on 31, August 1993, after a period of seven years and four months.

PARC and the provincial research institutions should re-examine the recommendations already prepared by review teams and consultants and accept them or reject them, then put those accepted into action. PARC should establish a capacity,

perhaps in the Directorate of Planning, to continuously monitor the process of examining and implementing recommendations and decisions by management. The ARP II project will provide a much needed mechanism to reform research management, especially the management of personnel and finances, and to prepare long-range research plans.

Some lessons learned, or relearned:

- It takes time to change a government's management practices.
- For successful implementation, project objectives must be achievable.
- The implementing government's agency and the donor organization should agree, beforehand, on project objectives and implementing strategy.
- There should be a mechanism in the implementing governmental agency to follow up on recommendations made.
- High quality long-term contract staff are critical.
- Host country personnel must want to accomplish, and must believe it is possible to accomplish, whatever is being attempted.

1.0 INTRODUCTION

At the partition of British India in 1947 Pakistan virtually had no agricultural research organization. Since then, the agricultural research network has evolved, through a series of changes and, sometimes counterchanges, into a system with very significant physical facilities, trained personnel, and capabilities. However, much of its potential capability is yet to be fulfilled. Currently the system consists of research organizations in the Provincial Departments of Agriculture and Livestock, three major agriculture universities, three agricultural research institutes under the Atomic Energy Commission, and several Federal research institutions, the most significant being the Pakistan Agricultural Research Council (PARC) and its research entities. The North West Frontier Province (NWFP) is unique in that the research organization has merged with the agricultural university. Since agriculture, hence agricultural research, is designated as a provincial subject by Pakistan's constitution, cooperation between federal and provincial research organizations must be achieved through consensus. This is also true for cooperation between PARC and universities as well as other federal organizations.

The quantity and quality of research staff and facilities varies a great deal among the provincial and federal research organizations, but on the whole there is considerable talent and facilities for agricultural research. This is true in large part because of donor assistance to agricultural research. USAID and the World Bank have been the largest donors by far. The Ford Foundation, the United Nations Development Program (UNDP), Canada, Italy, Germany, Switzerland and, recently, Japan have made significant contributions.

Currently the effectiveness of the national research system is far below its potential. There are two principal reasons for this: (1) operating funds are discouragingly low and (2) the management systems stifle productivity of researchers. Regarding research management, the management of personnel and finances need the most attention. In provincial governments essentially all personnel decisions are made on

the basis of seniority. Moreover, there is no promotion ladder that a researcher can ascend to continue the same research focus. As a result, a sugarcane breeder who is ready to be promoted from grade BPS 18 to BPS 19 may find himself taking the job of oilseed breeder simply because that is the only BPS 19 position available. Fortunately PARC, the research institutes under the Atomic Energy Commission, and NWFP have adopted systems that permit movement up the seniority scale in the same research focus.

Autocratic decision making in personnel management is the rule in both provincial and federal organizations.

Financial management throughout the national research system is inflexible, ponderously slow, and tedious. Rather than serving the researchers, financial management views itself as a watchdog, raising endless questions and objections, frequently on matters of program rather than accounting. Research programs experience frequent delays because the financial machinery moves so slowly, and researchers spend much too much of their time trying to satisfy the demands of the financial system.

As in many developing counties, in Pakistan there has been little multidisciplinary research carried out in the past. The National Coordinated Research Programs have fostered a measure of cooperation by scientists of different disciplines, but on the whole little research was done by teams of researchers from different scientific disciplines. In 1986 when Winrock staff arrived to begin the MART/Winrock component, Pakistani scientists had not been exposed to the Farming Systems Research (FSR) concepts and methodology to any significant degree.

Pakistan and some of the international agricultural research centers have had a long and fruitful relationship. The International Maize and Wheat Improvement Center (CIMMYT) has cooperated with the coordinated wheat and maize research activities in Pakistan since the mid 1960's, and as a result, the wheat and maize research programs are perhaps the strongest of the commodity research programs. The International Rice Research Institute (IRRI) was closely involved in the 1960's and 1970's though their presence has

tapered off in recent years. The International Crops Research institute for the Semi Arid Tropics (ICRISAT) has been a major cooperator though their effectiveness is limited because of the distrust between Pakistan and India. Recently, as part of the MART project, The International Centre for Agricultural Research in Dry Areas (ICARDA) has played a major cooperative role.

It was in this setting that the MART Project was designed.

2.0 PROJECT DESCRIPTION

2.1 Introduction

The MART project was a large and complicated assistance project (from the project management point of view). There were three contractors: CIMMYT, ICARDA, and Winrock International. CIMMYT's responsibilities were to assist the national Maize and Wheat Coordinated Research Projects. ICARDA's responsibility was to strengthen the Arid Zone Research Institute (AZRI) and research in arid zones nationally. Winrock was charged to strengthen research management, establish a national FSR program, help establish a national capacity to produce TV and radio information modules and a national communications network, and to help PARC improve the management of its overseas and national training activities. Moreover there were project funds for practically all project activities that were directly operated by USAID.

In addition USAID funds in other projects (ACE, ASSP) could be used to support initiatives identified by the MART project.

This report will be restricted to those activities for which Winrock had contractual responsibilities.

Winrock International's Contract with USAID

The initial contract between USAID and Winrock International was effective 1 April 1986 with a completion date of 30 September 1990. Winrock's first Long-Term (LT) staff reported on 1 July 1986, but there had been Winrock Short-Term (ST) consultants in Pakistan prior to 1 July. Over the course of the project Winrock's contract was extended five times and the Schedule and Statement of work was revised three times. The following table indicates these changes:

Date	Amendment No.	Termination date altered to	Scope of work changed
01 Nov 89	003	30 March 91	delete Training Officer; add PROS II
01 Jun 90	004	30 September 91	-
30 Sep 91	009	31 December 91	-
01 Oct 91	010	31 March 93	as recommended by mid term evaluation report
01 Apr 93	013	30 April 93	-
02 May 93	015	31 August 93	additional scope of work

Please refer to Annex 1 for a summary of Winrock's budgets and annual expenditures.

2.2 Objectives of the MART Project

In 1984 when the MART Project was initiated USAID had been the largest donor to agricultural research in Pakistan for almost two decades. USAID was the main contributor to the construction and equipping of the National Agricultural Research Centre (NARC) and the training of its staff. The World Bank Project, ARP-I, also made a major contribution to PARC's overall development. By 1986 NARC had developed into a major research center with spacious offices and laboratories, sophisticated scientific equipment, and ample research fields, both irrigated and rainfed. Lacking was a modern, sensitive management system to stimulate NARC scientists to function at high rates of productivity. In contrast the provincial research systems had received much less donor support.

In addition to improved research management USAID also perceived other needs in the national system. The research system needed a capacity to produce radio and video modules, and a national network of agricultural communicators to effectively transfer technology from researchers to farmers and agribusinessmen. Also there was a need for more efficient management of students being sent overseas for training, and better management of the Training Institute at NARC which provides training at the national level. There was a need to foster more multidisciplinary research and regular interchange between farmers and researchers through the building of a

national FSR program. Finally, there was a need to strengthen the management of provincial research institutions.

The MART Project, designed in 1983, was initiated in 1984. However, the first Winrock staff member joined on 30 June 1986 because of a spurious protest of the contract award by a competing consulting firm. The Winrock component of the MART Project had four components: (1) To assist in improving the management of research throughout the Federal and Provincial research system, (2) to help establish a national FSR program, (3) to help create a capacity to produce radio and TV modules and a national communications network for better information transfer, and (4) to help PARC improve the management of its training activities. What follows in this report is a discussion of these components. The reader is also referred to the end of tour reports of Winrock LT staff: Dr. Theodore Builia (Training) August 1988; Dr. Murray Dawson (FSR and NARC Master Plan) March, 1990; Dr. James B. Barnett, Provincial Research operations and Support (PROS) Specialist September, 1991; Dr. Bill C. Wright (COP and RMA) March, 1992; Dr. Cordell Hatch (Information Transfer) May, 1992; and Dr. Takumi Izuno (PROS-I and COP) August, 1993. Two mid-term evaluation reports may also be of interest. Both review teams were led by Albert L. (Scaff) Brown and are dated February, 1989, and March, 1993. The conclusions and recommendations that pertained to Winrock from the first evaluation report are attached as Annex 2. the Excutive Summary of the second evaluation report is contained in Apppendix 3.

2.2.1 The Research Management and Administration Component (RMA)

The Original MART Project

The MART Project Paper (PP), prepared in 1984, described the Research Management and Administration (RMA) component and listed six outputs expected to be achieved by the RMA component. A mid-term evaluation of the MART Project in January and February, 1989, made several recommendations for changes in project activities. As a result of this evaluation and because of changing USAID policies, the project was amended and a new PP was issued in June, 1990.

The original PP's description of the RMA component gave the following topics in which the project's activities would be concentrated.

Systems Analyses

The request for proposal called for two phases of implementation--first a series of systems analysis throughout the national research system of about 3-4 months, by a team of st consultants, to identify problems, their causes, and to propose alternative solutions for certain topics. These topics are given below. The second phase, of 1.5 - 4 Years, was to address the implementation of the recommendations of these systems analyses.

Research planning. The process of identifying research topics, establishing priorities, preparing projects, and evaluating research.

Research methods. This apparently referred to the methods of actually doing research. It also referred to fsr and to commodity research.

Organization and administration. An all-inclusive topic embracing administration of personnel, finances, standard operating procedures, reporting, communications etc., Through- out the federal and provincial research system.

Information flow. This topic included the farmer-extension-research flow of information, and the federal-provincial-university interchange.

Financing. Budgeting, disbursement, financial records, financial control, and financial reporting throughout the national research system.

These general systems analyses were never initiated for reasons that will be discussed later.

In addition to the topics identified for general systems analyses five "Specific Studies and Interventions" were identified under the management component in the Project

Paper. These were: (1) Farming Systems Research, (2) Funding of Agricultural Research, (3) Private Sector Participation in Agricultural Research, (4) Bookkeeping and Accounts, and (5) Research/Outreach Integration. The FSR activities were of significant magnitude, and not specifically a management intervention, therefore they were treated by Winrock as a separate project component.

The Mid-Term Evaluation

A mid-term evaluation, in January-February 1989, noted several problems in the execution of the MART Project and recommended a number of actions to improve its implementation. One significant conclusion of the evaluation team was:

"Two interrelated conclusions may be drawn: (1) the rigidities in public sector management are more intractable than anticipated, and do not respond readily to traditional interventions of the type programmed into MART; and (2) otherwise competent and responsible senior managers are unwilling to risk their careers by taking management decisions outside their traditional technical program areas. Defining the conditions that lead to these constraints is beyond the capacity of this team. However, failure to define and ameliorate such conditions is a major reason for very slow progress in improving management. We suspect, but do not know, that system rigidities are based on administrative need (e.g., to avoid a political spoils system), but have degenerated into obstructive behavior. We suspect, but cannot generalize, that many individuals will not act without specific delegation of authority, which may not be common in this environment.

"The comprehensive expectations of the MART Project are flawed by the nature, magnitude, and timing of resources relative to the nature of the problems and the size of the system. Nevertheless, the flexibility and good will with which the project has been managed have corrected some of these problems."

"Over the long run, correction of the rigidities in public sector management is essential to effective and efficient government. Such an undertaking is beyond the scope and capability of MART."

The Amended MART Project

In June 1990 a revised project paper was prepared for the amended MART Project. The substance of the amendment was partly a result of the mid-term evaluation and partly a consequence of USAID/Washington's shifting priorities. The most important change in the amended project was a stronger focus on the linkages between research and the private agribusiness sector and the utilization of the results of research. Although the PP was issued in June 1990 and the project activities were altered to address the amended PP, the PC-1 was not given final approval by GOP until 11 April 1992. This, in itself, is an indication of the deliberate speed with which the machinery of governments (both U.S. and GOP) move at times.

As stated in the PP, the project goal and purpose is to: (1) develop and disseminate improved technology and information through key research institutions; and (2) foster a collaborative relationship whereby research institutes serve private agribusiness and farmers and use the private sector to disseminate marketable, improved technologies.

Adopting one of the recommendations of the mid-term evaluation, the scope of the project was narrowed to focus on nine research institutions: PARC, NARC, AZRI, University of Agriculture Faisalabad (UAF), Ayub Agricultural Research institute (AARI), ARI Sariab, NWFP University of Agriculture, Sindh Agriculture University (SAU), and ARI Tandojam.

The amended PP emphasized three areas for project activities: (1) Ensuring Research Responsiveness, (2) Technology Development, and (3) Dissemination. These project activities areas were described to include the following:

Ensuring Research Responsiveness

Under this topic the amended PP identified several sub-topics.

Private Sector Contribution to Planning

The project was to assist PARC in aggressively looking for ways to increase the contribution of private sector agribusiness in research planning. The basic thrust was to help develop PARC's Directorate of Agribusiness Relations to achieve, among other things, better interaction between PARC's scientists and the agribusiness sector to ensure that PARC's research projects address the real needs of the agribusiness community. The FSR program was another mechanism for determining farmers' problems that need research.

Research Prioritization and Master Plan Implementation

This topic dealt with the implementation of master plans at NARC and AZRI, and the preparation of provincial master plans.

Enhancing Researchers' Understanding of Private Sector Needs

This was to be accomplished through a series of workshops, seminars, visits, and publications involving scientists and members of the private agribusiness sector.

Public Sector Incentives for Responsiveness to the Private Sector

This topic envisioned three types of incentives to be made available to researchers to form strong links with the private sector.

Technology Development

Under this subject four sub-topics were described.

Farming Systems Research

A continuation of the current national FSR project with stronger emphasis on getting technology adopted by farmers.

Arid Zone Research

This topic was served by ICARDA

Economic/Social Science Program

This was a continuing emphasis on strengthening the national capacity to do research in social sciences, especially the Agricultural Economics Research Units (AERU's).

Research Grants Program

A major national program for competitive research grants managed by PARC/BOSTID (Board on Science and Technology for International Development).

Dissemination

Three sub-topics were described.

Private Sector Dissemination

The project attempted to forge linkages between research and agribusiness resulting in private sector dissemination of technologies.

Audio-Visual Production

This was a continuation of the effort to develop a national AV studio at NARC and the capacity to produce AV modules.

National Network of Agricultural Communicators

This was a continuation of efforts to create a national network of agricultural communicators through establishment of national and provincial Technical Information Transfer Committees (TITC and PITCs) and Provincial Agricultural Communications Support Cells (PACS Cells).

2.2.2 Farming Systems Research (FSR)

The basic scope of work for the FSR component was not altered throughout Winrock's contractual period although the emphasis on various activities varied. For example the Project Amendment placed much more emphasis on the transfer of the technology generated by FSR than on the research aspects.

The contract stated that Winrock was required to develop and institutionalize a national FSR program and to integrate this program with the traditional commodity and disciplinary research programs.

The FSR advisor was also charged with assuming the primary responsibility for preparation of the NARC Master Plan.

2.2.3 Information Transfer (IT)

The scope of work for the IT component remained constant throughout Winrock's involvement in MART. Winrock was responsible to help design and equip a multi-media production studio at NARC with a national mandate. Winrock was also charged to help select and train staff for this studio. A further responsibility was to assist in bringing about a better interchange and cooperation among all parts of the national agricultural communications system and to strengthen the system through training, assessing information needs of client groups, and to assist in the design and production of multimedia programs and other outputs.

2.2.4 Training for the Agricultural Research Network (TARN)

The scope of work for this component also was not altered during the life of Winrock's contract. Winrock was required to assisting PARC to identify personnel needs and to define training activities to meet those needs, to expand the physical capacity of the NARC training facility; and to assist in improving the management of PARC's overseas student program and NARC Training Institute.

For the first two years of the Winrock contract the training component was the responsibility of a LT, resident specialist. After that period USAID and Winrock mutually agreed to rely on recurring ST consultants to accomplish the scope of work. The savings from the LT training specialist position were utilized to provide a second PROS position to concentrate on Sindh and Balochistan.

2.2.5 Agribusiness/Research Linkages

The emphasis on Agribusiness/Research Linkages was a result of the June 1990 Project Amendment. The amended project focussed on private sector involvement in research by strengthening the PARC Directorate of Agribusiness Relations; fostering more interchange between researchers and agribusinessmen through workshops, seminars, visits, and publications; involving the private sector in identifying topics for research; utilizing the private sector in the dissemination of research results; and establishing joint projects to conduct research to solve specific problems or to apply results of research already conducted to specific problems existing in the private sector.

3.0 ACHIEVEMENTS AND SHORTFALLS

Winrock's LT staff had the primary responsibility to implement the project's activities as described in the contract between USAID and Winrock. However, Winrock utilized a number of ST consultants, both local and international, to assist in the implementation process. Appendix 4 gives details about Winrock's LT staff. Appendix 5 lists local ST consultants. Appendix 6 gives details about international ST consultants.

3.1 Research Management and Administration (RMA)

System Analyses

The systems reviews described in the Winrock contract were not initiated because of several reasons. Foremost was the opposition to this strategy by PARC's senior management, in part because these sorts of studies had been carried out in the past and a great deal was known about these subjects. The PARC Chairman had approved the PC-1 (a duplicate of the PP) but he had not studied it in detail. He indicated that he had approved the project after USAID officials assured him that the details of project components and their implementation described in the PP and PC-1 were "indicative." In PARC's view all elements of the project were negotiable. This position caused considerable confusion among Winrock staff as they began to implement the project because many of the project's activities (as described in the PP and PC-1) were approved, disapproved, or redesigned by PARC management. Another reason the systems reviews were rejected was that the strategy was deemed unworkable because of the enormity of the task and the dynamics of the national system. Pakistan is a democratic republic in which, as far as agriculture is concerned, the provinces are independent from PARC, the federal research organization. Cooperation and joint activities between federal and provincial research entities must be arrived at by consensus. Work rules and the management of personnel and finances in the provinces are determined by provincial governments. PARC has no authority whatsoever to make changes in the way provincial research institutions manage their affairs. Moreover, the Pakistani constitution specifically designates agriculture (including

agricultural research) as a provincial subject, and the provinces guard their right jealously. In the past there was considerable resentment of PARC by the provinces who perceived PARC to be competing with them for funds, personnel, and other resources.

Although the nation-wide systems analyses were judged to be unworkable, a strategy was adopted to review, analyze, and make recommendations for improving smaller, discrete elements of the research system. The review of the National Coordinated Research Programs in 1987, the management review of NARC in 1988, and the review of the Soils Department of AUF in 1989, are examples of the application of this alternate strategy. Yet, this strategy had its own drawback--the managers of the research component to be reviewed first had to be convinced that such a review was needed and that progress could be made in improving the management of the research component. The Winrock technical assistance team was not successful in convincing very many managers that changes were needed in research management procedures or that changes actually could be made even if sound alternative management practices were identified and described. Most thought it would be impossible to get the bureaucratic provincial governments to change management policies, especially those that dealt with personnel and financial procedures.

Another obstacle impeded progress toward completing project objectives--that of implementing changes after the problems had been studied and workable improvements were identified and described.

Research Planning

There were several significant, but admittedly only partially successful, accomplishments in research planning. The partial success resulted mainly from the failure to implement the recommendations of review teams and master plans.

The largest effort in planning was MART's assistance to PARC and NARC to develop a Master Research Plan and a Master Physical Plan for NARC. Under the leadership of Dr. Murray Dawson and with the help of a number of ST consultants, the

professional staff of NARC prepared and published in 1989 a detailed plan for the development of the research program and the physical plant to the year 2000. The plan defines NARC's mandate, provides a detailed research agenda, suggests ways to improve the organization and administration, and provides a detailed guide for future development of the physical plant. A serious flaw in the research plan that needs correction is that the budget guidelines adopted by the planning team (taken from the 1988 report of the National Commission on Agriculture) were too optimistic for the reality of today's budgets. This has resulted in plans for more research than can be supported by current budgets. This flaw can be corrected by re-prioritizing the research projects and shifting funds from the lower priority projects to those with higher priority. However, the better solution would be to appropriate more funds for research and provide NARC with a realistic budget.

The master plan was preceeded by an excellent review of NARC's management, by a team of four Pakistanis and one Briton, and followed by a review of NARC's financial procedures by a Pakistani chartered accounting firm.

Regrettably very little of the master plan has been implemented and only a few of the recommendations of the management review or the financial review have been put into action. Before February, 1990, the management review recommendations were discussed at length by committees in PARC, and some decisions were taken to implement certain of the recommendations, but little action followed. From February, 1990, until recently the subject was dormant. A principal reason for the inactivity was the lack of a full-time Director General at NARC. When this writer arrived in Pakistan on 30 June, 1986, the NARC DG occupied the position on a part-time basis. Since then, there was no full-time DG except for a period of about 13 months which ended on 1 March, 1989, when Dr. Yousaf Chaudhry retired. Finally, on 12 April 1993 a full-time DG was appointed ending a period of more than four years of part-time DG's. This is a very positive step and Chairmen PARC is to be congratulated for filling this crucial position with a full-time appointee. Now that a full-time DG has been appointed, he should be given the full responsibility and authority to manage the institution.

In 1987 the National Coordinated Research Programs (NCRP) were reviewed, resulting in recommendations for significant changes in their management. The NCRP's are the most important mechanism PARC has to help fund research in the provinces and to coordinate research at the national level. These programs deserve much more funding than they receive now, and they need improved management. Several of the recommendations of the review have been implemented. For example, earlier the NARC research activities and the activities of the coordinator were co-mingled with the national activities. Now there is a clearer delineation between NARC research and the National Program. Also the decision was made to provide separate posts for the NARC research leader and the national coordinator where possible. Although some recommendations of the review have been put into action, PARC needs to re-examine the recommendations and positively adopt or reject those which have not been implemented.

Punjab's research directors over the span of the MART Project showed little interest in preparing master research plans or reviewing management procedures. The ARI, Tandojam, in Sindh did agree to prepare a research plan, and work was started only to be stopped by the heightened security problems in the province. The University of Illinois through the TIPAN Project took care of the needs of the NWFP. Only Balochistan, after an agricultural scientist was named DG for research, actively sought assistance in preparing a provincial research plan. PARC, under one of the three Chairmen who served during the RMA/COP's tenure, actively pursued the preparation of a master research plan for NARC, its major research unit. ICARDA had the responsibility to assist AZRI to improve its management, including research planning.

The Agricultural Research Institute, Sariab, in Balochistan is the only other entity that has made significant progress toward a research master plan (AZRI has prepared a master plan with ICARDA assistance). With Winrock assistance a plan was prepared in draft form that prioritized research topics, identified sites where substations are needed, and gives estimates for funds needed, facilities required, and staff development needs. It also suggests a reorganization of the ARI based on commodity lines and research problem lines.

Research Methods

The major effort in assistance from MART to improve research methods has been in connection with the FSR program which is addressed in Dr. Murray Dawson's EOT report and discussed elsewhere in this report. Other activities on this topic were the development of shortcourses on Field Plot Technique by Dr. James Barnett and several training courses in biometry by ST consultant Dr. Roger Petersen. In the process of assisting ARI, Sariab, and ARI, Tandojam, prepare research plans, Dr. Barnett discovered that past experimental results had not been analyzed and interpreted. While helping to analyze these experiments he observed that the researchers' understanding of experimental design, statistics, and general field plot technique was poor. With the help of three staff members from SAU and ARI, Tandojam , he organized a two-week shortcourse on these subjects and presented the course at Tandojam twice and Sariab once. Dr. Barnett also developed a user-friendly computer program ("Easystat") for the analysis of variance of field experiments which has been distributed widely in the research system.

Dr. Roger Peterson, as a result of three ST consultancies, taught several shortcourses on biometry in all parts of Pakistan. He also wrote three manuals on statistics which were published by the MART project. These manuals have been welcomed by scientists and are in great demand.

Dr. Marlin Van Der Veen conducted several training shortcourses for FSR and other researchers in various locations in Pakistan on different aspects of agricultural economics, especially farm management.

The MART Project sponsored and funded a number of training courses focussing on research methods. Some of these were instigated by Winrock; many were planned and presented by Pakistani researchers. Some examples are workshops on the use and maintenance of scientific equipment, plant disease diagnosis, computer modeling in integrated pest management research, soil physics research, livestock research methodology, and forestry research methodology.

Organization and Administration

One of the first requests to Winrock was to assist PARC to collect in one volume all its administrative orders, standard operating procedures, and other administrative directives. The goal was to prepare an Administrative Manual. In 1987 Winrock hired a former PARC Administrator, Major (Rtd) M. A. Qureshi, to accomplish this task. Major Qureshi was uniquely qualified because he had served for long years as an administrator in Pakistan's Atomic Energy Commission and was PARC's administrative officer in PARC's formative years. He knew, so to speak, where all the bones were buried. Over a three month period the consultant assembled almost all of PARC's administrative directives, edited them, and prepared them for publication. There was, however, a technical problem which had to be addressed. A considerable number of the administrative directives had been written, discussed by PARC management, but no official action has been taken to adopt them. They were, in effect, still in "draft" form. Major Qureshi was very much concerned that if the administrative directives were published by PARC there was a danger of them being used as officially approved directives when they were not. Following his recommendation, only four volumes of PARC PAD (PARC Policy and Administrative Directives) were produced. These went to PARC Chairman, PARC Secretary, Winrock, and the consultant. To this writer's knowledge, there has been almost no follow up by PARC to adopt these administrative orders and to publish the official PARC PAD.

The NARC Master Plan and the Research Plan for ARI, Sariab, described previously dealt with the organization and administration of those two institutions. Other MART activities that focused on organization and administration were the 1988 review of NARC management ("the Khattak report"), the review of NARC maintenance, ST consultant assistance to strengthen the capacity to maintain and repair scientific equipment, and to develop and manage experiment station farms, the review of the Soils Department at AUF, and the subsequent Blue Ribbon Panel review of the entire university.

The Soils Department at UAF was reviewed in 1989. A team of three eminent soil scientists and educators (one Pakistani, two American) assisted the department's members to conduct the review. The review report gave many recommendations to improve the department's curriculum, research, management, and student relations plus recommendations which would improve the management of the university as a whole. The MART project intended to assist other departments at UAF with similar reviews, but these plans were displaced by a review of the entire university by a Blue Ribbon Panel Committee arranged by USAID/Islamabad. The Soils Department responded to the recommendations as best it could. The Department reviewed the recommendations and put into action all that they accepted and that did not require additional funds to implement. There was simply not enough funding available, or to be had, to allow the Department to adopt recommendations that cost money to implement. In December 1990 Winrock provided the services of ST consultant Dr. Robert Mac Adam, who was a member of the Blue Panel Review of UAF, to follow up on the recommendations of the review. The consultant reported that the university's senior officials were definitely interested in implementing the recommendations and that significant steps had been taken to do so.

Routine maintenance of buildings, vehicles, laboratory equipment, and field equipment at NARC is poor. In fact the maintenance of buildings is almost zero. The budget allocation for maintenance is minuscule. Buildings are not clean, plumbing often doesn't work, and the main buildings' expansion joints and other roof areas have leaked for years with no correction. This situation led USAID officials to delay construction of three buildings which were planned for construction under MART, "until NARC demonstrated that it could adequately maintain the buildings already constructed." This planned construction was later canceled by USAID. In 1990 MART arranged for a review of all the maintenance operations at NARC by a team of three Pakistani engineers led by Col. (Rtd) Masood Ahmad. Sound recommendations were made, including estimates for an adequate budget at NARC for maintenance work. These recommendations have yet to be acted on.

NARC has a Laboratory Equipment Maintenance and Repair Unit (LERMU) that has the mandate to help provincial agricultural research organizations and NARC to maintain and repair scientific equipment. This is an excellent concept; the unit is sorely needed in the national research system. The unit appears to have adequate staff and equipment, but has almost no operating funds. In the past almost all travel by the unit's staff to provincial locations was funded by the Winrock contract. The MART Project provided ST consultant assistance for the LERMU to further train its staff and to strengthen its organization. The consultant also provided a technical manual on the operation and maintenance of laboratory equipment which was distributed widely. The LERMU director was given a tailor-made, 6-weeks training program at Cornell University, especially designed by the ST consultant who worked with the LERMU. Currently the LERMU probably has the capacity to be very helpful in keeping scientific instruments running in the research system, but it cannot function until it has a reasonable budget and the staff is motivated.

A training course was prepared and offered at NARC, for a national audience, on the development, organization, and management of agricultural experiment stations. The shortcourse was designed by Dr. Ernest Nunn, previously director of ICRISAT's farms and now at IRRI, and Mr. Loyd Johnson previously director of CIAT's farms. It was taught by Mr. Johnson, Dr. Ashraf Chaudhry a Pakistani/New Zealand agricultural engineer, and Mr. G.N. Shahid, a former Director of NARC's Farm Operations and Management Unit. Farm managers from all the provinces and the PARC system attended. A thoughtful recommendation from the workshop was that NARC should institute an "apprentice" training program in which farm managers from the provinces would be deputed to NARC for a period of several weeks for hands-on training, working with the Department of Farm Operations and Management.

Information Flow

In the original Project Paper this subject was described vaguely and incompletely as, "...systems of data collection and analysis and the flow of information from farmers through extension to researchers, operations reporting by field

managers to program directors, and information sharing among Federal and Provincial research entities, between research and extension agencies, and between research organizations and the agricultural universities. (The packaging and dissemination of research findings will be addressed under the Information Transfer component of this Project.)"

The largest influences on information flow by Winrock's activities (other than the IT component) have come from FSR, the library strengthening project, the agribusiness activities, and the reports produced by PARC and Winrock.

By definition FSR aims to link together farmers, extension workers, and researchers to identify real problems to be researched, to conduct the research in farmer's fields, and to make the resulting findings of that research available to the extension service and farmers wherever the findings are relevant. This is being done with more and more confidence and effectiveness in all four provinces. True, the FSR program needs to be improved, expanded, and institutionalized; nevertheless it is up and running at a respectable pace.

The library strengthening program is a major force in upgrading agricultural libraries throughout Pakistan. Twenty-one agricultural libraries have received information databases consisting of journals (back issues and current issues) and other publications on microfiche, and databases, bibliographies, and publications on CD-ROM. Equipment to access the CD-ROM materials-- computers, along with readers, printers, and copiers have been provided. The library staff members were trained to operate this equipment, but this training needs to be continued. Pakistan's agricultural library system today is as modern as any developing country's. More details are provided in the Information Transfer section of this report.

Winrock has published a large number of reports on many subjects and has assisted PARC to strengthen its Directorate of Publications. Currently this Directorate is carrying out its responsibilities very well in spite of grossly inadequate office facilities in rented space in Islamabad's Blue Area. The Directorate of Publications deserves better facilities and better recognition for its achievements. A list of

publications published by Winrock is attached as Appendix 7. Appendix 8 lists the items published by PARC with MART/Winrock funding.

The MART contract directed Winrock to assist PARC to establish strong linkages with the International Agricultural Research Centers and important national research institutions in other countries. In fact PARC needed no assistance to accomplish this objective. In 1986, and since, PARC has had strong interactions with the IARC's, and many other research organizations. PARC's ties with CIMMYT and IRRI have been especially strong for decades. PARC's Chairman and Members have served and still serve as Members of the Board of Directors of several IARC's and as members of the Technical Agricultural Committee (TAC) of the CGIAR. The location of IIMI's research center in Pakistan was strongly influenced by PARC's management. A large number of Pakistani scientists have received training at various IARC's and several Pakistanis are currently IARC staff members. IARC staff are frequent visitors to Pakistan, and Pakistan receives a very large amount of germplasm and technical information annually from the IARCs. The linkages between Pakistan and the CGIAR system are strong, indeed.

Financing

If it can be said that PARC/NARC has a single most serious problem, then the procedures for making funds available to scientists and the final accounting for these funds would be it. Funds are usually made available to scientists late, sometimes causing a planting season to be missed or other serious delays. This occurs even when the funds are available in the finance departments of PARC/NARC. Once the funds have been spent much time is consumed in satisfying the accounting demands. These complicated procedures were further exacerbated by GOP's requirement that MART funds first be spent by PARC, then reimbursement claimed from USAID. The solution to these problems is to examine the financial procedures to determine where they can be simplified, to simplify them, then to train both the accounting staff and the scientific staff in the correct procedures to operate the system.

To this end Winrock engaged a local chartered accounting firm (the same firm which reorganized PARC's accounting system) to review the financial procedures at NARC. One of their recommendations was to computerize the accounting system at NARC in the same format as PARC's. This work was completed in March 1993. The other recommendations are yet to be evaluated by PARC. PARC, with Winrock assistance, published and distributed a Financial Handbook, prepared by staff of the Directorate of Accounts, which should help staff members understand the correct financial procedures of the PARC system.

Project activities pertaining to the funding of agricultural research and accounting procedures, are discussed elsewhere in this report.

SPECIFIC STUDIES AND INTERVENTIONS

Funding of Agricultural Research

Dr. Robert E. Evenson of Yale University, a world authority on returns to investment in agricultural research, was contracted by Winrock to conduct a major study of the financing of agricultural research in Pakistan. Dr. Evenson, Mr. Qazi Taukir Azam (a PARC economist), and Yale graduate students did this study over a two year period and documented it in an extensive technical report. PARC and Winrock prepared, published, and distributed widely a brief, easily-readable, well-illustrated summary of the technical paper. The longer paper by Azam, Bloom, and Evenson was published as a PARC Technical Paper with Winrock assistance. Among the findings of this study, four stand out: (1) Investment in agricultural research in Pakistan pays very high returns (marginal internal rates of return to investment in wheat research of 76% for the period 1956-1986), (2) Pakistan invests less per scientist of any country in this region which includes Nepal and Bangladesh, (3) the cost of doing research is cheap, and (4) Pakistan is seriously underinvesting in research. By publicizing the results of this study it is possible that the decision-makers in the GOP (and USAID) will be convinced that agricultural research is not only critical, but is a good investment. Hopefully adequate funds will be

provided for agricultural research in the future. A valuable by-product of this study was the establishment of a major database concerning the funding of Pakistan's Agricultural Sector and various other agricultural statistics regarding production and infrastructure.

Private Sector Participation in Agricultural Research

In 1987 ST consultant, Dr. Mumtaz Ahmad, made a comprehensive study of research being conducted in the private sector. A large number of agribusiness firms were included in this study, ranging from very large to very small. More than 1100 agribusinesses were listed in an appendix to the report, but not all of these were contacted during this study. The study revealed that the private sector was doing very little research, even within the larger firms. Most of the activities counted as research by this study were merely testing of various products, such as pesticides for example. The bulk of research and development activities in the private sector was actually product development and promotion. Only the tobacco and sugar industries were found to be carrying out activities that could rightfully be called research. The consultant estimated that there were no more than 500 persons engaged in agricultural research and development in the private sector and no more than Rs 39 million spent on research and development, of which only about Rs 15 million went towards research.

Two main reasons account for the lack of investment in research by the private sector. The first is that changing government policies make it a risky investment. This statement is true for investment in agricultural businesses, in general, as well as for research. Subsidies, tax forgiveness, and other inducements (or taxes on the other hand) may be here today and gone tomorrow. The second is that there is no protection for the developer of proprietary technology or intellectual property in Pakistan. Although laws may exist to prevent the uncontrolled exploitation of proprietary products, technology, and intellectual property, they are unenforced. Thus, the firm that invests in research cannot be certain that it will reap the benefits of that research.

By 1991 the private sector climate had changed significantly. Several multinational firms entered into agricultural business, especially the seed industry. However, to date there has been little research by these firms, only the testing of their lines to determine their suitability to Pakistan's ecology. The current government's emphasis on privatizing the Pakistani economy, if realized, will surely heighten the private sector's interest in research.

The Directorate of Agribusiness Relations of PARC is charged with the responsibility to encourage and intensify the interchange between researchers and the agribusiness community. These activities are discussed in Section 4.5 of this report.

Bookkeeping and Accounts

Under this topic there are two main achievements. The first is the installation of a modern, double-entry accounting system at PARC headquarters and the computerization of the system. In 1986 PARC had already engaged a Pakistani chartered accounting firm to prepare an accounting manual. Winrock hired a second chartered accounting firm to install this accounting manual and to computerize the system. This was successfully accomplished over a period of about two years. Today PARC staff have the capability to operate the system independently. This has brought a vast improvement in the financial information that is now available to PARC's management. Within a week after the end of a reporting period PARC's management can obtain a current status report of expenditures and remaining balances, and these can be provided for a variety of applications, such as project-wise or institute-wise accounting. The inventory and fixed assets components have not yet been computerized because of the lack of data, but the general ledger, MIS, and payroll functions are complete.

A review of NARC financial procedures by Peat Marwick in 1990 recommended, among other things, that the accounting system be computerized. At that time the accounting system, maintained by hand, was months behind real time. This caused much confusion in the management of the Center's finances. The computerization of the Center's accounting department

began in 1991 with the purchase of a three-station computer local area network and the needed software. After delays caused by damage to the computer during shipment, the work was begun and finally completed in March, 1993. There is some question however whether or not NARC is fully utilizing this computer capability. It is suggested that NARC management may wish to review the situation to make certain that this valuable tool is fully utilized.

A further action under this topic was to prepare a feasibility study of the computerization of the UAF. This work was carried out by Peat Marwick, but the recommended plans could not be implemented due to a lack of funds. Partly as a result of this study, Peat Marwick was engaged by the TIPAN project to computerize the NWFP Agricultural University's accounting system.

Research/Outreach Integration

The MART Project Paper described this special topic as follows: "The systems analysis described previously will identify management improvements in the area of research/outreach integration. The contractor shall provide assistance to PARC to field-test and demonstrate these interventions initially in Islamabad District. Islamabad District was chosen because of its unique status. PARC was recently given overall responsibility for the development of the agricultural sector within the District. This includes the responsibility for extension. A pilot area, therefore, exists in which research and extension activities are under the direction of a single government agency with a degree of autonomy atypical of the rest of Pakistan. The contractor shall work with PARC staff in the Islamabad District, which will serve as a living laboratory for designing, testing and demonstrating off-station research, communication efforts, information transfer methods, farming systems research, and extension approaches. The contractor shall also assist PARC to replicate nationwide those interventions which have proven successful or appear promising."

The goals of this special topic were probably not achievable from the beginning and were made clearly unachievable when the general systems analyses were ruled out

and when the responsibility for the extension activities in the Capital District were transferred from PARC to the Capital Development Authority (CDA). In Pakistan the responsibility for extension activities lies with the Extension Directorates of the provincial Departments of Agriculture. Research and Extension are in the same Department of Agriculture, but they are distinctly separate. PARC has no mandate to do extension work and would be hotly contested if it tried to carry out extension activities in the provinces. In 1986 PARC did have responsibility for extension work in the Capital District, a highly atypical farming area, but that was ended in November 1988 when the responsibility was transferred to the CDA.

Winrock's effort to address this special topic was through the FSR program which has had some success recently. From the beginning the FSR program made sincere efforts to convince the extension agencies to join in as full partners. These efforts met with limited success and sometimes hostility. The reasons for this are not clear to this writer. Possibly it was partly because the extension departments have an adaptive research component and they viewed FSR as a competitor. Possibly it was the result of FSR being identified as a PARC program which recalled older animosities.

In the past year or two of the project better relationships between FSR and the provincial extension organizations developed because of persistent efforts by FSR to include extension. Very probably the better cooperation was partly the result of each partner getting to know the other better over time. The better cooperation resulted partly from different personalities assuming authority in the provinces.

In 1992-93 an example of cooperation between research, extension, and the private sector was found in the No-till Wheat Production Campaign. This campaign's goal was to demonstrate the value of drilling wheat into standing rice stubble. This technology permits earlier seeding of wheat after rice, thus improving wheat yields; it saves the cost of tillage; and often it reduces the weed population in the wheat crop. It requires a no-till wheat drill and information about the technology. The technology is very promising. The no-till campaign was led by Punjab's Lahore Region Director of

Extension with researchers and the private sector as partners. The extension service identified farmers who cooperated by planting no-till wheat, and they gave assistance to the farmers; the researchers supplied the no-till drills and trained extension personnel to use them; private sector representatives provided information about the drills and the use of fertilizers and herbicides. In the 1991-92 season 528 acres were planted with no-till drills. NARC agricultural economists studied the socio-economic aspects (which included crop-cutting to establish yield levels). A locally manufactured drill was modified for no-till drilling for sale locally. One pesticide company donated herbicides to the campaign worth Rs. 200,000. The results of the 1991-92 no-till campaign showed that no-till wheat yield about 260 kg/ha more than the conventionally tilled plots. Because of the savings in land preparation and increased yield, no-till wheat produced about Rs. 1,100 more net profit per hectare that the conventional plots. This no-till campaign was not continued in 1992-93 for reasons unknown. Because the no-till technology has great promise to increase wheat yields and profits from wheat following cotton, PARC should consider re-starting this production campaign.

In the long run the integration of outreach and extension will continue to be a problem in this writer's view. The extension agencies are huge organizations staffed with many poorly trained persons. It is difficult to make significant changes in such organizations. Research and extension continue to be separate directorates, even in NWFP where research and the agricultural university have been merged. In these respects Pakistan is very much like most other developing countries in Asia. And in many of those countries efforts to achieve integration of research and outreach have met little success.

3.2 Farming Systems Research (FSR)

Farming systems research is essentially an approach to agricultural research that attempts to accomplish three basic things: (1) It treats the farmers' system as a whole, not focussing on only one crop or one activity; (2) it emphasizes multidisciplinary research; and (3) it involves the farmer so that his real needs and his limitations are taken into

account. The inclusion of the extension service, preferably as a part of the FSR team, is a must if FSR results are to be transferred to farmers. In establishing a national FSR program a decision was made not to staff the program with a corps of full-time FSR staff members. A fully staffed FSR program could essentially replace the entire research organization. Rather, there would be a few full-time staff in the national coordinating cell and in the provincial cells, but the bulk of the research would be planned and carried out by staff drawn, as needed, from other programs and from various scientific disciplines. A very necessary requirement, however, is a specific budget for FSR operations.

Until the MART project got under way in 1986 most agricultural research in Pakistan had been commodity oriented, aimed at increasing the productivity of specific crops. The national coordinated crop research programs (such as wheat, maize, rice, etc.) incorporated researchers of different disciplines, such as plant breeders, agronomists, plant pathologists, but the focus of the research was on the particular crop in question. Little attention was paid to the interaction of the crop under research and the other components of the farmer's system -- how does it fit into the cropping sequence, does it contribute to the animal production components in the systems, does the crop production practices fit to the availability of labor, and many more of these kinds of interactions.

Because, at the start of the FSR program in 1986, Pakistani scientists were mostly unfamiliar with FSR concepts and methodology, much time was spent in the early days of the project in training scientists. The first introduction of the FSR program was an 8-day national workshop at NARC, "On-Farm Research with a Farming System Perspective." This workshop was followed by many more workshops, seminars, field days, travelling seminars, and countless one-on-one and small group on-the-job training sessions. The following list illustrates the kind and extent of FSR training activities that were presented. Pakistani and foreign ST consultants sometimes helped present these training sessions (Table 1).

Table 1. FSR Training Activities under MART

Date	Title	Duration	Location	No. of Participants*		
				T	F	P
Feb 87	FSR Methodology Workshop	2 days	Lahore	30	22	8
Mar 87	FSR Methodology Workshop	3 days	Tandojam	68	-	68
Apr 87	FSR Training Workshop	4 days	Dhodial	50	3	47
Apr 87	Livestock in FSR Workshop	8 days	Bahadurnagar	25	-	25
Apr 87	FSR Workshop at ARI Dohdial	3 day	Mansehra	50	6	44
Jun 87	FSR Data Handling Workshop	6 days	NARC	25	5	20
Feb 88	FSR Travelling Seminar and Planning Workshop	3 days	Tandojam	40	2	38
Mar 88	FSR Travelling Seminar	4 days	Faisalabad	25	-	25
Mar 88	FSR Workshop	3 days	Quetta	24	-	24
Apr 88	Short Term Training for FSR Farmers	1 day	Mansehra	36	-	36
Jun 88	FSR Survey Methodology and Practical	8 days)	Quetta	21	-	21
Jun 88	Workshop on the Role of Rural Women	3 days	NARC	42	-	42
Aug 88	FSR Microcomputer Training and Data Analysis	12 days	NARC	22	4	18
Sep 88	FSR Travelling Seminar and Planning Workshop	6 days	Faisalabad	30	2	28
Mar 89	FSR Field Day	1 day	Hala	135	2	133
Oct 89	FSR Institutional Workshop	3 days	Quetta	26	8	18
Nov 89	FSR Livestock Trial Design Workshop	3 days	Bahadurnagar	10	-	10
Jul 89	Poultry Husbandry at	6 months	Punjab	50	-	50

	Fatehjang FSR Target Area					
Jul 89	Pest Control at Fatehjang FSR Target Area	5 months	Fatehjang	45	-	45
Jul 89 Jun 90	Improving Skills of Rural Women for Field Pest Control	12 months	Fatehjang	50	-	50
Feb 90	FSR Monitoring and Evaluation Trining	18 days	4 provinces	12	7	5
May 90	FSR Fatehjang Women Poultry Production	6 months	Fatehjang	60	-	60
Mar 91	FSR Travelling Seminar	4 days	Shahkot/Proka	50	-	50
Aug 91	Sindh FSR Project Review and Future Plans - Karachi	2 days	Karachi	12	-	12
Sep 91	FSR Travelling Seminar	4 days	Lahore/ Faisalabad	25	-	25
Oct 91	FSR Workshop on Trial Designs Data Collection and Economic Analysis	4 days	Punjab	20	4	16
Nov 91	FSR Travelling Seminar/Impact Study	4 days	Quetta	24	5	19
Feb 92	Teaching and Demonstration of Poultry Management to Rural Women	18 days	Shahkot /Proka	20	2	18
Apr 92	FSR Travelling Seminar Training	4 days	Quetta	27	-	27
May 92	in Improved Milk Processing Technique for Women	6 days	Rawalpindi	30	-	30

* T - Total
F - Federal
P - Province

In addition to the in-country training FSR scientists attended several training sessions abroad and participated in study trips abroad. These are summarized in Table 2.

Table 2: FSR Work Plans and Training Abroad Participants, 1987-90.

Workshops/Seminars	No. of Participants
Thailand workshop	4
Indonesian workshop	2
FSR/Arkansas	5
IRRI Training	2
CIMMYT Training	4
	17

To manage the new national FSR program several organizations were established. Farming Systems Research Committees were established at the national and provincial levels. The National Committee, which meets biannually, helps formulate policies to achieve FSR objectives, approves the overall research direction and objectives, and gives support by improving linkages between various provincial and federal agencies. The Provincial FSR Committees perform the same tasks at the provincial level. They also review and sanction annual workplans and personnel assignments and monitor the progress in achieving FSR goals. These national and provincial committees have not been active in recent years although in July 1992, there was a meeting of national importance which included Vice Chancellors of the agricultural universities and Provincial Directors of Research. The need for the National and Provincial FSR committees should perhaps be reassessed. The National FSR Coordinating Cell, composed of a Coordinator and five Associate Coordinators (for Economics, Livestock, Agronomy, Range and Forestry, and Women's Activities), is located at NARC and is charged with coordinating the national FSR research program. In the provinces FSR Site Coordinators guide the FSR research team, or teams, who actually design and carry out the research at FSR sites with the help of site field assistants.

By the end of 1987 FSR teams in all provinces and NARC were conducting research on farmer's fields at seven sites. Table 3 shows the collaborating institutions that were involved.

Table 3: Collaboration by Provincial Participant Institutions by Province.

Province	Participant Institutions
NWFP	Agriculture University/Extension/NARC
Punjab	Agriculture University/AARI/Extension/ NARC/Forestry
Sindh	Agriculture University/AEARC/ARI.
Balochistan	Departments of Agriculture, Livestock and Forestry, AZRI, Extension, NARC

At the end of Winrock's contract period the National FSR Coordinating Cell was in place and operating acceptably. FSR research teams were in place and functioning in each province (in spite of severe hardships, especially in Sindh), research results were being transferred to farmers, albeit on a small scale, and more and more scientists, farmers, agribusinessmen, and extension personnel recognized the value of the FSR approval. A fledgling women's component was being carried on with impetus from the Associate Coordinator for Women in the National Coordinating Cell. At UAF FSR concepts were being inserted into the curriculum by individual faculty members, and post-graduate students were using the FSR research program to conduct their thesis research in at least three provinces. The UAF initiated the task of organizing the preparation of a book on FSR techniques which could serve as a textbook for teaching FSR at the university level. This effort is now being led by the national FSR coordinating cell. There has been a significant amount of "feed-back research" generated -- research at the experiment stations on problems unearthed in the farmers's field by FSR. A number of FSR publications, including two on women's activities, have been prepared and circulated. Eight TV modules on FSR subjects have been prepared or are in preparation. However, only Balochistan had provided funds for FSR in its non-development budget, and only Balochistan had formally assigned researchers to the FSR

program. PARC has committed to funding FSR from the non-development budget beginning 1 July 1994. Except for NWFP, Balochistan, and the NARC component, participation of the extension services was still at a low level. The NWFP extension service and the Balochistan extension service has been involved in FSR since the beginning. Since the appointment of the current FSR Coordinator and the shifting of the FSR site to Gujar Khan, the NARC team (working in Punjab) has enjoyed excellent cooperation from the extension service.

The most important steps to be taken is to institutionalize the FSR program by providing funding through the non-development budget at the federal level and in Sindh, Punjab, and NWFP; to formally assign personnel to the program, a few full-time and more part-time; to enlarge the use of FSR principles and methodology in all applied research; and to spread the teaching of FSR concepts and methodology throughout Pakistan's agricultural universities. FSR should be expanded to more locations throughout the country and to different kinds of farming systems. The women's component needs strengthening. Stronger efforts are needed to disseminate successful research results in partnership with extension, perhaps through pilot-to-production programs.

In this writer's opinion perhaps the most important result of the FSR program will be to spread to other researchers the basic underlying principles of FSR -- involve the farmer to make certain that research is directed toward real problems; think of the farmer's system as just that, don't isolate a component of the system as a research target; and bring to bear in the research area the scientific disciplines necessary to adequately solve the problem.

Following is a listing of interventions that have been validated and are being promoted or that are in the validation stage for the FSR target areas.

Shahkot/Proka (Punjab)

- Introduction of Mungbean in Wheat-Rice System.
- Introduction of an improved system (wheat-75% and lentil-25%) instead of wheat alone.

- Zero-tillage technology for early planting of wheat in rice-wheat system.
- Improvement in wheat-fallow-wheat system through introduction of sesamum.
- Hay/silage making and effects of its feeding on milk production in cattle and buffaloes.
- Increasing the productive and reproductive performance of lactating animals through feed and mineral supplementation.
- Effect of some new fodder/cultivars on the crop yield, fodder availability and livestock production.
- Improving water use efficiency though land levelling in maize-wheat system.
- Comparison of dry seeded rice vs. transplanted rice under farmers conditions.
- Relay cropping of wheat into cotton-wheat system.
- Comparison of recommended vs. farmer levels (heavy doses) of insecticide on Bringal.
- Comparison of cultural, mechanical and chemical weed control in different crops.
- Testing of tube-well water for rice-wheat system.
- Effects of anthelmintic use on wool yield, weight gain and lambing percentage in sheep.
- Plantation of fodder trees and grasses on lining of water courses, on marginal land, and on normal soils.

Fatehjang/Gujar Khan (NARC)

- Introduction of high fodder yielding mustard varieties for mixed and intercropped wheat.
- Introduction of varieties of fodder oats for higher fodder production.
- Introduction of improved production technology of lentil and chickpea.
- Introduction of sunflower, soybean and Mungbean into the existing wheat-fallow-wheat system.
- Introduction of sunflower into wheat-sorghum-fallow-wheat system.
- Introduction of high quality sorghum variety with recommended fertilizer application.
- Control of infectious and parasitic animal diseases through vaccination, deworming and chemoprophylactic measures.

- Introduction of rapeseed (Canola) in place of wheat in rabi season at medium rainfall area.
- Planting of drought tolerant plant species of iple iple, safada, kikar, ber and shisham on marginal lands.
- Demonstration of improved poultry breed along with better health and feed management practices.
- Flushing of sheep and goats to improve the productive and reproductive performance.
- Study the effect of mineral supplementation on weight gain, milk production, and reproductive efficiency of large and small ruminants.
- Introduction of feedlot system by using agroindustrial waste or by-product (citrus pulp).

Hala/T.M. Khan, (Sindh)

- Intercropping of onion in sugarcane with improved agronomic practices.
- Adoption of zero-tillage technology to introduce wheat as additional crop in onion-fallow-onion system.
- Availability of pure seed of rice, cotton, wheat and mungbean.
- Studies on spray schedule at economic injury level for sucking insects and bollworms of cotton.
- Studies on the fattening of male calves through improved feeding and management practices.
- Introduction of Mott dwarf Napiergrass for improving fodder availability during the "lean" period.

Dhodial, NWFP

- Introduction of soybean into wheat-maize-wheat system.
- Introduction of lentil into maize-fallow-maize system.
- Improvement of maize productivity by introducing new variety.
- Control of weeds infestation in the maize and wheat through the use of selective herbicides.
- Control of core rot decease of apple through the application of micro nutrients and fungicide.
- Top working/management to avoid barrenness in apple.
- Varietal trails to introduce peas in mono-crop area.
- Introduction of onion along with chemical control of downy mildew in mono-cropped area.

- Introduction of an early, fine cultivar of rice.
- Comparative fodder production of different fodder varieties of oats vs. wheat.
- Introduction of superior varieties of walnut trees.
- Introduction of improved breeds of poultry.
- Introduction of Mott dwarf Napiergrass.

Kanak Valley (Balochistan)

- Introduction of improved wheat variety Pak-81.
- Improved variety and balanced fertilizer application in potato.
- Seed treatment for the control of wilt disease of cumin.
- Training to farmers about appropriate pruning/top working and spray schedule in apple.
- Control of bark splitting and other diseases in apple.
- Improving the breeding potential of small ruminants through disease control, supplement feeding and flushing.
- Block plantation of multipurpose trees on farmers fields.
- Studies on onion transplant vs. broadcost sowing and use of balanced fertilizer.
- Improved variety & balanced fertilizer application in alfalfa and control of alfalfa weevil specially when cropped in orchard.

In the past two years there have been shifts in the emphasis of FSR activities and in the FSR sites. The NARC component shifted its FSR site from Fatehjang to Gujar Khan in Rawalpindi District. At the same time, through the urging of the PARC Chairman, the emphasis was shifted considerably to focus more on technology transfer and production practices. In this work the Rawalpindi extension service has cooperated closely with the FSR team. However, there is still a significant research component in this FSR program.

In Punjab the FSR work at Shahkot has been reduced but not discontinued, and technology transfer/production campaigns have been initiated in the Gujranwala, Gujrat, Sialkot area for rice/wheat farming systems and in Toba Tek Singh and Jangh for cotton/wheat farming systems.

In Balochistan the FSR target area has been shifted from the Kanak valley to Khad Koocha. Balochistan is the leader among FSR teams in that non-development funds have been made available for FSR and staff have been formally assigned to the program. Moreover, Balochistan leads other FSR teams, except NARC, in developing a women-in-FSR program. Funds have been made available specifically for the women's component and reconnaissance surveys have been conducted.

In Sindh the Hala and Tando Muhammad Khan sites are still operative

A recent development at NARC is the creation of the Sustainable Agricultural Research Institute (SARI), formed by grouping the FSR program, the Operational Research Program, and the Technology Transfer unit under SARI. The Coordinator FSR has been designated the Director, SARI. In August, 1993, the establishment of SARI had been notified, but the three components had not yet begin to function as a single institute. At this point in time it is not known how the creation of SARI will affect the FSR program, if at all.

The second Mid-Term Evaluation of the MART project was critical of the FSR program, stopping just short of recommending that FSR activities be discontinued. The evaluation team cited three reasons for considering discontinuing FSR. The first reason was that FSR, in the evaluation teams view was not conducting research but was involved in extension activities. This, they contended, was the job of the extension service and, FSR was not needed. The second reason was that good researchers were already in contact with farmers and knew their conditions and problems. FSR was not needed as an intermediary. The third reason cited was that FSR was too expensive, that too many researchers and too much infrastructure was devoted to too few farmers. The evaluation team believed that FSR would not be sustainable by Pakistani resources after the termination of the MART project.

The evaluation team has raised good points for consideration. If the FSR teams are to be utilized in production campaigns, extension campaigns rather than conducting multi-disciplined research on the real problems of farmers in farmer's fields, then there is good argument that

FSR is not necessary. Provincial Extension Services were created to do this work. On the other hand if FSR teams are directed to conduct farming systems research, with the extension service as partners, in which case the FSR teams discover new technology, and the extension service mounts campaigns to extend it to farmers, then there is a case to be made for continuing the FSR program. The latter seems to be the current situation since there is a significant research component in the FSR program even though increased emphasis has been placed on transfer of technology campaigns with the extension service.

The point made by the evaluation team, that good researchers are in close touch with farmers appears to be the idealized case. While it is certainly true that the very best research scientists do contact farmers regularly to keep in touch with their needs and conditions, the majority of agricultural research scientists are not familiar with the real world of small farmers. Farming systems research is a methodology that provides a way to overcome this knowledge gap.

Finally, the evaluation team's view that FSR will be too expensive to be sustainable beyond MART is probably true under certain conditions. If there is no good cooperation with the extension service (from the beginning of the research) so that the extension staff, not the FSR staff, can spread the technology discovered by FSR to all the farmers in the applicable ecological area (recommendation domain), then FSR will be non-sustainable. Likewise, if an attempt is made to assign scientists to the FSR team full-time for every discipline that is required, rather than the FSR core team utilizing scientists from other disciplines on an as-needed basis, the FSR program will be non-sustainable. However, if extension is involved as a partner from the outset and if the FSR research team is suitably staffed by a small core of full-time researchers, supported by part-time researchers in the scientific disciplines dictated by the research problem, FSR can be sustained.

In response to the criticisms of the FSR program by the Second Mid-Term Evaluation report, the FSR Coordinator convened a meeting on 12, 13 June, 1993, of the coordinating

staff and Provincial FSR Coordinators to consider the evaluation team's comments. The FSR group unamiously agreed that the FSR program was necessary, pointing out that FSR is the only research program that includes the farmers input. They noted that, as a result of FSR there was, in general, a greater spirit of cooperation among scientists of various disciplines.

Perhaps the greatest value of FSR will be to popularize the use of FSR philosophy and methodology among other, hopefully all, research scientists. This reason alone, perhaps, justifies the continuation of the FSR program.

FSR is at a critical juncture. It is strongly recommended that PARC, the provincial authorities, and the FSR scientists review the current program to determine: (1) whether the current emphasis on production programs is justified or should there be a return to an emphasis on research, (2) whether there is a justification for continuing FSR as a key means of determining the farmer's real problems, and (3) will the provincial and federal resources be able to sustain FSR after the MART project terminates.

3.3 Information Transfer (IT)

The IT component was, by a long margin, the most clearly conceived and described component in Winrock's part of the MART project. Basically Winrock was required to help create the capacity to produce video and audio modules to support agricultural research and development nationally. To achieve this a production studio building was to be designed, constructed and equipped, and staff hired and trained to man the production studio. Winrock was also charged to help establish a national network of agricultural communicators.

Perhaps because of the straightforwardness of this project component and because of the high professional quality of Winrock's Information Transfer Specialist, the small number of professionals in NARC's AV Unit, the architect who designed the building, and PARC's Director of Works this component was successfully accomplished.

In addition to the work described in the PC-1 two major "extracurricular" sub-projects were inspired, if not led, by the Winrock Information Specialist. One was a $1 million procurement of library materials to strengthen 21 major agricultural libraries throughout Pakistan. The other was the procurement of 270 computers and accessories for the national research system (170 for the research system; 100 for SAU). Both of these procurements were made with USAID funds outside the MART Project. Another "extracurricular" activity was the agricultural textbook publishing project.

The Information Transfer Specialist for the MART Project arrived in Pakistan 17 July 1986. His work began at the National Agricultural Research Centre with Anwar Ali Chaudhry, Director of Scientific Information, as counterpart. Six weeks later, Mr. Chaudhry left for a six-year consultancy in Nepal. Malik Mushtaq Ahmed, Director of Publications, PARC, was appointed Scientific Information Director and Information Transfer counterpart. A year later Dr. Anwar Hassan was hired as Director of Audio-Visual Communications and became a co-counterpart. With good support and assistance from all, a program was launched for developing comprehensive audio-visual communications and information transfer services at NARC and throughout the country.

Need and Potential

In 1986 the agricultural research system already had established print media units to publish annual reports, journals, newsletters, and other publications. Audio-visual communications, however, hardly existed. Except for the limited activities and services of Scientific Information Unit little in the way of audio-visual communications existed at NARC. The MART Project gave special attention to this need.

An audio-visual production center was to be designed and built on the National Agricultural Research Centre campus. It was to be equipped and staffed. The staff was to be trained and audio-visual modules produced. A management structure was to be organized. The audio-visual production capabilities at NARC were to be linked with other key locations. In short, the foundation for a national system of audio-visual agricultural research communications was to be established.

The Building Program

The first priority was to design and construct space for the new audio-visual communications program to be launched at NARC. The NARC Training Institute also needed additional space. Instead of two buildings, it was decided to design one which would be adequate for both units.

Working with Dr. James Miller, MART Architectural Consultant, design plans for the new Audio-Visual Communications/Training Institute Building were developed. Collaborative efforts resulted in floorplan designs for both AVC and TI facilities.

Rough specifications for each room were developed. These showed dimensions, the equipment and furniture to be installed, special lighting and electrical requirements, the staff to be located in each room, and the functions to be performed there. From these specifications, professional engineering plans and construction designs were made. Construction started on the Audio-Visual Communications/ Training Institute Building in 1988. The new building was occupied in early 1991.

The AVC Director recently has criticized the AVC building as being, "... badly designed and constructed. The studio is neither sound-proof nor it has proper lighting arrangements." (See the consultant's report by M. Nazeer Chaudhry. A Review of the Consultancy Reports, 8 August 1992, p46) Other complaints were also registered by the AVC Director. In this writer's judgement these complaints are not justified. Any faults in the building are not serious enough to affect its intended use. In any case a very high percentage (80%) of any TV shooting should be done on site, in the field and laboratory, not in the studio.

NARC AVC Directorate Staffing and Management

The MART PC-1 specified seventeen professional staff positions for the NARC Directorate of Audio-Visual Communications. Of these nine were filled at the conclusion of the Winrock contract.

Except for the Director in grade BPS-19, all grades were set at the BPS-17 level or lower. At least four (Senior Producer, Senior Scriptwriter, Senior Cameraman, and Senior Engineer) should have been at BPS-18 to attract the highest quality applicants. A media researcher or on-air talent would be a valuable staff member also. Eventually, those lower ranking employees deserving promotions could move into these slots.

The staff recruited were reasonably well trained and experienced for their respective jobs. The engineers, cameramen, and producers are fully capable of performing their respective jobs. However, the absence of scriptwriters, artists, and on-air talent have slowed progress. These should be given top priority in PARC's future hiring.

The PP and PC-1 specified nine participant training slots (240 pm) for the Information Transfer component, five federal and four provincial. When the Winrock team arrived in the summer of 1986, virtually all the training slots in the MART project had been allocated, and none went to persons in the IT component. In fact the persons who perhaps needed the training most, the AVC staff, had not yet been hired. The lack of training opportunities for TI staff was a continuing topic for discussion, arguments, and mourning, but with little success. In April of 1990 a senior Public Relations Officer from the PARC staff was sent to the University of Wisconsin to study for the M.Sc. degree in Information Sciences. This was the only scholarship filled by IT staff during the period of Winrock's contract.

Work performed by the present staff has been of good quality. The problem was that there was too little of it. Except for occasional spurts of activity, there was a general lack of concentrated, sustained effort.

PARC/NARC administration needs to put the AVC Directorate on a firm schedule of productions. In mid 1993, the weekly radio program was going fine. Likewise, there should be a weekly TV production, even if it is only five or six minutes long. The Shalimar Television Network is sure to use it, even repeat it, and it could be offered to Pakistan Television Corporation (PTV) on a free basis. Nothing beats a regular

broadcast schedule with firm commitments, a rigid deadline, and expected compliance.

Equipment for Information Transfer

Prior to the MART Project little audio-visual equipment existed in the nation's agricultural research, extension, and training institutions. The Scientific Information Unit at NARC and the Agricultural Information Office at Lahore were the best equipped. Most of the other information offices were relying largely on print media. The MART Project gave proper focus and support to the other media, especially audio-visuals and video.

MART called for the development of a national center for the production of audio-visual agricultural materials. Early in the Project equipment was ordered (cost $219,000) which could be used for training and productions while awaiting construction of the AVC/TI Building. This was modest and low-priced equipment but adequate for what was to be done at the time.

An assortment of more than 100 items was provided to establish the Provincial Agricultural Communications Support Cells in Faisalabad, Lahore, Peshawar, Quetta, and Tandojam. Additional, and more sophisticated items, were later provided at a of cost $400,000. This included Super-VHS highband camcorders and 3/4" U-Matic Highband Superior Performance (SP) editing recorders. The cells in Lahore and Faisalabad also received professional camera and field recorders (3/4" SP). This equipment allowed all cells to produce broadcast-quality tapes as well as excellent masters for duplicating VHS copies for wide distribution to targeted audiences in the provinces.

New equipment for the AV Center at NARC is of high quality and compatible with all TV stations and networks in Pakistan. Two 3/4" SP field-recording systems were purchased. Highband 3/4" and Super VHS editing and production equipment is provided along with a number of backup units. Digital special-effects and switching equipment, audio mixing, monitoring, and other sophisticated items are available.

The Audio-Visual Communications Production Center at NARC now has all the equipment and necessary supplies to produce a large number of high-quality AV materials and to do so on a regular basis.

Information Transfer Network

A major commitment was made to establish a functioning information transfer network within the research system. The national Technical Information Transfer Committee (TITC) took the lead on this, especially during the first years of MART. It helped build relationships among communications leaders and promoted development. Its leadership role, however, was not sustained. The TITC should be a forum for deciding and then doing, not just a group exchanging reports. Under strong leadership it still could serve national needs, and it could provide the framework for building the profession of agricultural communications.

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 establishing Provincial Agricultural Communications Support Cells, identified the most serious farm problems, and developed information transfer strategies for solving these problems. MART provided equipment and funds to support the work.

PACS Cells were established in Faisalabad, Lahore, Peshawar, Quetta, and Tandojam. Each received the same complement of MART equipment and training, but accomplishments were dependent almost entirely upon local leadership and staff. Some did a lot; others did little. An example of what could be achieved is illustrated in the following Table 4 summarizing the video and audio production of the PACS Cell at Lahore.

Table 4. Production of the PACS Cell Lahore

	Video		Audio		Video coverage
	No. produced	No. copies distributed	No. produced	No. copies distributed	at important events, No.
1990	10	137	22	1237	11
1991	5	232	24	1519	28
1992	6	322	22	904	19
upto May, 1993	8	160	8	88	3

Administrative shifts in Balochistan and Sindh have not helped in providing the direction and support needed. The PACS Cells have struggled and not met information transfer and research documentation needs in these two provinces.

The cells and committees in all provinces should continue, but they work best when higher administration is deeply involved and supportive. The PACS Cells and their staffs will achieve no more than is expected of them, and that should be a lot. And as part of a national network, the producers should share their output with others in the system. All communications staffs in the provinces and the federal units need to be contributing members of a nationwide information transfer network.

Computerizing the Research System

Before MART there were a few Apple II computers around in the research system but not much else. Fairly early in the project, 50 IBM AT compatible computers were purchased by the MART project. Distribution was nationwide and met only the most critical needs. Nevertheless, these computers started a revolution in the way much work was done in the research system.

An extensive program of computer training was initiated on 2 January 1989 with the inauguration of the National

Computer Training Laboratory at NARC. Since then, hundreds have been trained in computer operations as well as beginning, intermediate, and advanced courses in practically all software packages used by the scientists and their staffs.

During the last year of the project, an additional 270 computers were purchased (170 for the research system; 100 for SAU). These have the 386 chip and are more powerful than the earlier models. They too were distributed throughout the research system. With their installation, the current need for computers is reasonably well satisfied.

To support communications and information transfer at key locations, ten Computer Graphics/Desktop Publishing Workstations were included in the procurement. These were assigned strategically to provide graphics and publishing support to the largest number of scientists. Each of the Provincial Agricultural Communications Support Cells received a CG/DTP workstation, as did PARC Publications, AVC, NARC Advanced Computer Training Lab, Bureau of Agricultural Information in Peshawar, the D.G. Research (Livestock and Dairy) in Lahore, and the Cotton Research Institute in Multan. These will greatly improve the quality of graphics and published materials. These Graphics/Desktop Publishing computers are powerful electronic tools with immense potential value if they are utilized properly. Because of their versatility and complexity it is necessary that carefully planned training courses on the use of this equipment be continued and, indeed, intensified. This training should be organized by the NARC Training Institute. One or two persons from each location should attend these training courses. There are funds in the MART Project (which doesn't end until 7 August 1994) that can be used to support such training.

Agricultural Textbook Publishing

Visits to agricultural universities and libraries in the early years of MART revealed the poor state of agricultural textbooks and study materials. The textbooks used on campuses were few, inadequate, outdated, and not relevant to Pakistan. USAID and Winrock began to plan a program to publish new, much-needed textbooks in Pakistan, about Pakistan, for Pakistan.

It was determined that textbooks should be based on the latest and most comprehensive of agricultural knowledge available. The texts should meet the needs of students at all agricultural universities. Narrow, regional perspectives and data which become obsolete rapidly were unacceptable. The focus was to be on general scientific truths, concepts, and procedures of particular relevance to Pakistani students.

In the beginning the MART Project and PARC were to lead in commissioning and producing new textbooks. A number of meetings were held for this purpose. Titles were suggested and preliminary procedures worked out. During this period, however, it became quite clear that if textbooks were to be relevant and useable by university students, the teachers of the agricultural universities had to be very much involved. In fact it was decided that they should be the principal authors of the books rather than the scientists in the research system.

With TIPAN being a major university development project, it was recommended to USAID that the lead should be taken by the TIPAN team at the NWFP Agricultural University. The idea was accepted, and the MART Information Transfer Specialist worked closely with TIPAN in setting up a National Agricultural Textbook Task Force and in establishing parameters for publishing the textbooks. The leadership and work since have been handled entirely by the TIPAN team.

The task force identified ten textbook titles; six were given top priority. Their titles are:

1. Crop Production

2. Animal Production

3. Soil Science

4. Horticulture

5. Plant Breeding and Genetics

6. Extension Methods for Pakistan

Most of the chapters for the six books have been written and are now being edited, illustrated, and prepared for printing.

The Pakistan National Book Foundation will manage printing and distribution and will collect revenue from book sales which will cover costs of future printings and revisions. If sales are strong, the income generated could be adequate to publish the four additional titles and possibly other needed agricultural textbooks.

As of August 1993 one text had been published: Extension methods for Pakistan.

Library Strengthening Program

Everyone who had seen and tried to use the agricultural research libraries in Pakistan knew they were generally poorly stocked and equipped, had wide gaps in references and scientific literature, and the institutions had little money to correct the situation.

USAID and PARC officers had long been aware of the problem, but no strategy or funds were in place to make improvements. Under the MART Project, a study of the nation's agricultural libraries was conducted in 1987. At about this same time, University Microfilms International contacted MART, PARC, and USAID officers to describe what services and products were available. Out of meetings in 1987-89 came a plan to strengthen libraries at the 17 (later, 4 more were added) most important agricultural research institutions in Pakistan. See Appendix 9 for a listing of these libraries.

Arrangements were made for $1,000,000 in USAID ACE Project funds. A PIL was processed in favor of UMI as a sole-source provider of relevant and up-to-date knowledge databases and the necessary equipment and support for properly managing it.

Using interviews and workshops, the scientists and officers at each of the 21 (initially 17 but 4 more were added later) institutions identified and prioritized the research journals which were most important to them. This was the

basis for all microfilm and microfiche ordered from UMI. Equipment required to store, manage, and access the microformed knowledge was purchased. Operating software and bibliographic/reference files on CD-ROM also were purchased.

While awaiting delivery and installation of the knowledge databases and equipment, staffs of the libraries were trained in "Modern Library Technologies and Management". After the equipment and databases were installed, librarians and scientists received on-site training in how to use the computers and search software. Administrators were encouraged to require thorough and up-to-date reviews of literature from all researchers. And the scientists were urged to make maximum use of the new information resources.

Now agricultural libraries are well prepared to support better and more meaningful research in Pakistan. They have new and improved knowledge databases. Extensive backfiles of important journals, selected by the local scientists, date from 1985 through 1991. Full-text articles and abstracts are available on microfiche, microfilm, and CD-ROM. And they are easy to read and copy.

The knowledge is easily retrieved using computers and special search software packages. Articles and files can be viewed/read on the computer screen, copied to floppy disks, or printed. Microfiche and microfilm images can be viewed and printed also. Multi-standard VHS video players were provided so libraries could offer an audio-visual information service as well.

The 21 agricultural institutions receiving library support under MART are to network with the smaller institutions in their areas. In a sense, there are now 21 well-equipped hub libraries which can provide information outreach services to practically any point or person in Pakistan. The knowledge bases, computers, software, support equipment, and training make this a model information system for the developing world. It will certainly revolutionize the way scientists and others search for and use information.

Communications-Training-Outreach (CTO) Operations

Better organization, coordination, and administration of PARC/NARC Communications-Training-Outreach (CTO) staffs and operations are necessary for optimum transfer of agricultural research information and technology. The CTO units are all concerned with information and technology transfer. The units involved are Publications, Scientific Information (Library and Documentation), Audio-Visual Communications, News and Public Relations, Training, and Technology Transfer.

The PARC Chairman and NARC Director General provide some direction for those units, but what is needed is a person who knows or can get to know all the above units, what they are doing or not doing, what their problems and requirements are, and how they can work together to better transfer agricultural research information and technology to all these client groups served by PARC/NARC.

Missions of the CTO units are of such magnitude and importance that perhaps it is time to have a PARC Member for Communications- Training-Outreach (CTO). If not a full member of the Council, certainly a high-level official should be given this oversight responsibility. He should be capable of administering, supervising, staffing, budgeting, and coordinating the six units. And he should be genuinely interested and involved in the performance and welfare of all.

The Member, Consultant, Director, Chief, or Administrator for the CTO Division or Bureau would do those things on a full-time basis which are now shared or not done at all. The administrative and leadership requirements of these six units are no less demanding or important than those of existing PARC Divisions. Furthermore, if Pakistan follows the pattern of other developing countries, it is almost guaranteed that Communications-Training-Outreach are areas of growth and high resource commitment requiring a skilled, dedicated, technically-oriented officer-in-charge.

Training for Information Transfer

MART designed and sponsored a number of workshops, courses, and conferences to help train and develop the research system staffs. The most important contribution was in the field of computers.

In 1989 alone, 340 agricultural scientists received training in computer systems operations and software utilization. Almost half of these were from the provinces. The training continued at a similar level in 1990, but slowed in 1991. With 270 additional computers delivered, many new people need to be trained. NARC has facilities for the training, and in most cases the personnel qualified to do the teaching.

Considerable training was offered also in communications and information transfer fields, including:

- Scientific and Popular Writing
- Audio-Visual Communications
- Presentation Graphics, Meeting Management
- World TV Color Standards, Video Formats, Pause-Control Editing, Audio Dubbing
- Computer Graphics
- Computer-Based Desktop Publishing
- Basic Photography and Video Production and Editing
- Advanced Photography and Video Production and Editing
- National Agricultural Librarians' Workshop and Conference
- Presentation Graphics Workshop
- Modern Library Methods and Technologies
- Provincial Library Workshops (17 locations)

To support the formal training programs as well as self instruction, dozens of videocassette training tapes were purchased. Descriptions of these are found in the PARC Audio-Visual Media Resources Directory. They are available from the AVC and Training units at NARC.

After the MART Training Specialist left the project in 1988, much of the support required by the NARC training staff was provided by the Information Transfer Specialist. A serious effort was made to have Training and Audio-Visual staffs, sharing the same building, work together and help each other as much as they could. This is an objective which all NARC/PARC units should pursue.

3.4 Training for the Agricultural Research Network (TARN)

Winrock's main tasks under the TARN component were to assist PARC to enhance its ability to determine personnel training needs, to improve the management of overseas scholars, and to strengthen the NARC Training Institute. A special topic was to develop a national manpower development plan.

As stated earlier, the Winrock technical assistance team arrived late because of a protest over the award of the contract to Winrock. When the team arrived, all the long-term training positions had been filled and a large number of participants were waiting to be placed in universities abroad. The selection and placement process which had been set up by GOP and USAID was complicated and slow. In the provinces, nominations were made by research units and forwarded to the Secretary Agriculture who reviewed the nominations. Those approved were forwarded to the provincial Planning and Development Department which further reviewed the nominations and sent those approved to PARC. PARC's Directorate of Training then forwarded the nominations to the Economic Affairs Division (EAD) of the Ministry of Finance for final GOP approval. EAD notified USAID and PARC of those approved. At this time PARC sent to USAID the files of the approved candidates. USAID prepared a PIO/T describing the training to be accomplished and sent this to the Academy for Educational Development (AED), a private contractor hired by USAID to place students in foreign universities and service their needs

while abroad. In this process of selection of students from the provinces and placement in universities Winrock had no role, and PARC had only a functionary role. PARC selected students from federal organizations using rigorous selection criteria which PARC attempted to apply to all candidates, including those from the provinces. The provinces, however, would brook no "interference" from PARC and insisted on making the selection of all candidates from the provinces, using their own selection criteria.

AED in 1986-87 was placing about 1,200 Pakistani students each year, sponsored by various GOP ministries, in universities around the world. AED had set up a mechanism to deal with this large number of students which was not able to respond to special demands placed on it by the MART Project for rapid placement and special study programs. Moreover, AED had little agricultural expertise in its staff in Pakistan or Washington. Later USAID amended the contract with AED to require the provision of agricultural expertise which AED accomplished through a subcontracting arrangement with Winrock. When the Winrock team arrived in Pakistan, there were about sixty MART scholars waiting to be placed in universities. For this reason a decision was made by PARC, USAID, and Winrock that the Winrock Training Specialist should work with PARC, USAID, and AED to accelerate the placement of those scholars. This was done successfully--some 67 graduate students were sent abroad by September, 1987. This task took much of the time of the Training Specialist in his first year. Appendix 10 lists the MART students who studied for degrees abroad.

Because all the long-term training slots had been filled, the preparation of a national manpower development plan did not seem to be a critical exercise. Apparently the 84 Ph.D. and M.Sc. candidates had been selected without a careful consideration of the scientific disciplines needed to carry out future plans. As the Winrock team became more familiar with the national research system, it became clear that it was impossible to prepare a meaningful national manpower development plan because none of the research institutions, including NARC, had long-range research plans. If one doesn't know what kind of research is to be done in the future, one cannot develop a meaningful manpower development plan.

Under these circumstances PARC, USAID, and Winrock decided to that MART should concentrate on building a manpower and institutional database that would form the basis for developing a manpower development plan in the future, and to assist elements of the national research system to prepare long-range research plans and manpower development plans for individual research institutes. An extensive survey was designed and carried out to collect information about personnel and research institutions. This resulted in a database being established in PARC. These data are housed in the Directorate of Training, but a more logical location probably would be the Directorate of Planning. The current data were collected in 1987 and need to be updated. In fact PARC, in its role as the national coordinator of research, should prepare national databases for several subjects--personnel, institutions, funding for research projects, special research capabilities, centers of excellence, etc, and update them annually.

Two PARC publications resulted from these data: "Inventory of Agricultural Research Institutions in Pakistan," 1990, and "Directory of Agricultural Research Institutions in Pakistan," 1990.

Winrock also was charged with arranging for short term training for a large number of scientists both in the United States and locally. In 1987 and 1988 approximately 126 scientists were sent to the United States for specialized training, mostly through subcontracts with U.S. universities. The training courses were designed primarily by the Winrock Training Specialist and PARC's Director of Training with input from the U.S. universities. In 1987 the emphasis of each short course was about 50% on management of research and 50% scientific subject matter. In 1988 this mix was altered to put more emphasis on subject matter as requested by the participants. This training approach was successful on the whole but there were drawbacks. The candidates from the provinces, who were selected entirely by the provinces, had differing backgrounds (some highly trained, some not) and work experience (some senior, some junior). It is not possible to satisfactorily meet the training needs of such diverse groups in one training session. And sending scientists to the U.S. for short-term training was expensive. Appendix 11 lists the

trainees who received ST training abroad under the MART Project.

After 1988, USAID with Winrock concurrence decided to discontinue large-scale ST training in the U.S. Thereafter a large number of ST training courses on many different subjects was held in Pakistan under MART auspices. During the contract period more than 140 training courses were held, attended by approximately 5,000 persons from all over Pakistan. It should be pointed out, however, that Winrock was not involved in a large number of the ST training efforts. The MART ST training activities were financed by a PIL operated by USAID. In many instances requests for training courses were made by PARC to USAID with no Winrock involvement or knowledge. This is exactly the procedure that should have been followed; the only point is that the reader should not assume that all ST training under MART was a result of some action by Winrock. Appendix 12 lists the MART-sponsored in-country training courses.

After the Winrock Training Specialist left the project in 1988, a joint decision was made by PARC, USAID, and Winrock to fill that position with a Provincial Research and Operations Specialist (PROS) based in Sindh with responsibilities for Sindh and Balochistan. The PROS based in Lahore with responsibility for Punjab, Sindh, and Balochistan was overloaded with work. Recurring ST consultants would support the TARN component. Subsequently Dr. Frank Byrnes and Dr. John Woods provided ST consultancies for TARN. These two consultants assisted PARC personnel to prepare excellent plans for the future development of the NARC Training Institute and for PARC's Training Directorate, including a comprehensive re-entry plan for tracking participants abroad and easing their re-entry into Pakistan's research system. Many of the recommendations applicable to NARC's TI have been adopted and some of those pertaining to PARC Training Directorate are in place.

A hindering factor in strengthening the NARC TI was the inability of PARC to define the NARC Training Institute's mandate. In 1986 the TI Director, who had been a director of one of the provincial training institutes for extension personnel, had developed a curriculum aimed largely at applied

agriculture subjects--extension courses. It wasn't until Dr. C.A. Ozair was appointed Director in June, 1990, that the TI began to function as a training institution to help scientists and technicians acquire new skills and keep abreast in their scientific disciplines. Unfortunately Dr. Ozair has left this position and the Director TI is an additional charge of the Director of Scientific Information. However, the TI now functions as a true national institute offering training for provincial scientists at NARC and at provincial locations. With the new building and equipment provided through MART the Training Institute has excellent facilities to support a premier training program.

Perhaps an even greater hindrance in strengthening the TI was the lack of staff and failure to provide training for the staff that was in place. The PP indicated that GOP would hire 14 additional staff members 6 Scientific Officers (2 each in English language, Evaluation, and Training), 2 Administrative Assistants, 2 Junior Assistants, and 4 Drivers. Very few of the staff were provided. Although drivers were hired, some were assigned to other units. At end of the Winrock contract the TI staff consisted of eight professionals (including the vacant Director's position). None of the 10 (2 PARC, 8 provincial) degree training slots described in the PP were ever awarded to persons in the TARN component. All training slots were filled before Winrock staff arrived in Pakistan and, in spite of innumerable requests, no training slots materialized for TI staff. The PP also described a study trip abroad for training staff but USAID officials, after a particularly disappointing study trip for some university staff, arranged directly by USAID, would not support study trips abroad. However, later in the project's years study trips were arranged for the TI's Director.

Undoubtedly the single most successful training activity has been computer training. A ten-station computer training laboratory was established in January, 1989, at the time MART purchased fifty computers for the national research system. This lab is equipped with a LCD display palette and an overhead projector, that permits the instructor's monitor output to be projected onto a video screen. The lab can accommodate eighteen students, plus the instructor. The computer training lab has been in almost constant use since it

was established, and shortcourses have been offered for all sorts of computer applications. The students are eager to attend these courses, and they spend long hours, even after the instructions ends, at the computers. This is truly a national teaching facility; students come from all over Pakistan. The lab has even been made available to other USAID-funded projects for their training needs. A second computer training laboratory has been established at the NARC TI with computers from the 270-computer procurement.

Since 1992, the NARC TI has enlarged its role as a national training institute by offering its facilities and logistical support to projects outside PARC/MART which have an agricultural development objective. For example, the USAID-funded Food Security Management Project held a shortcourse on agricultural policies at the TI. The participants stayed in the TI hostels, ate meals in the NARC cafeteria, and used TI classrooms and equipment. The Food Security Management Project provided the instruction and paid the TA/DA of the students plus a user's fee to NARC TI.

Progress in strengthening PARC's Training Directorate was hampered by shifts in personnel. In 1989 the Director went for a one-year training program in the U.K. While he was abroad he was replaced by a person trained in plant pathology with no background in training management. Subsequently this Director was replaced by his predecessor. During the time when the first Director went abroad for training (Sept., 1989) until he was reappointed as Director (July, 1991) very little was accomplished for a number of reasons that will not be discussed here. Nevertheless, PARC has a respectable capacity to carry out the tasks of processing the clearance by GOP of students going abroad, of arranging for ST training activities abroad, and maintaining a database on students abroad. This database is computerized and, if kept up to date, is a valuable repository of information about students who go abroad for training. The Training Directorate, in this writer's opinion, should move aggressively to put into action the recommendations in John Woods October, 1990, report regarding the re-entry program for scholars.

A course to train staff members from most major agricultural research institutes across Pakistan to become Training Coordinators for their institutes was carried out successfully. After scientists of the research institutes (some university staff were also included) were selected by their Directors, they received training over a two-year period that consisted of two sessions in Pakistan (of about 4 weeks each) and one session in the United States (of 6 weeks). The training was directed by two faculty members from Oklahoma State University (one educator, one biological scientist) through a sub-contract. The students were taught how to determine training needs, to select trainers, to provide logistical support to the trainers, and to evaluate the effectiveness of training sessions. During the training session in the U.S., they attended a short-course at Winrock headquarters (to see how WI organizes training courses), they visited several national training centers (including one run by the U.S. Army), and they were given intense, specially designed training at the Oklahoma State University campus. A part of the training required each Training Coordinator to prepare a 5-year training plan for his research institute. These Training Coordinators are now able to oversee a meaningful in-house training program for their institutes. The only question is, will their skills be utilized for this purpose? Prior to beginning this two-year training program their Directors agreed to initiate a regularized training program at their institute prior to beginning this two-year training course. Subsequently the Chairman PARC, the Winrock COP, and the Oklahoma State course directors wrote to each of the institute Directors, explaining how the Training Coordinators can help strengthen their institute and urging the Directors to make full use of the Training Coordinator's skills.

Continuing training for staff in the provincial research institutes is very important. Many of these institutes are fairly isolated and do not receive the stream of visiting scientists that an NARC does. It is difficult for scientists in these institutes to keep up with the advances in their professional discipline, which makes a planed, regularized training program especially important. In spite of this importance few provincial training institutes have a regular

training program. The occasional departmental seminar is frequently the only training program that exists. It is strongly recommended that every research institute in the research system should establish a regular training program, utilizing the skills of the Training Coordinators where these trained coordinators are available. Course materials produced in the Training Coordinators training course will be useful where there is no trained Training Coordinator.

3.5 Agribusiness/Research Linkages

When the MART Project was amended in 1990, project activities were focussed more strongly than before on the private agribusiness sector. The principal goal was to involve agribusiness institutions in setting the research agenda and in disseminating the results of research to farmers and livestock growers. In 1990 PARC had already established an agribusiness subcommittee of its Board of Governors and made plans for the establishment of a Directorate of Agribusiness Relations, but little concrete action had been taken.

Winrock hired an Agribusiness Specialist in September, 1990, to help strengthen the Directorate of Agribusiness Relations. At that time there was only a Deputy Director (BPS 18) assigned to the Directorate. In late 1991 a Director was appointed.

The Winrock PROS specialist located in Lahore at that time also began to devote much more of his time to expanding contacts between researchers and the agribusiness community.

To date a significant amount of progress has been made. PARC has organized several seminars and workshops jointly attended by agribusinessmen and researchers to review problems faced by various sectors of agribusiness and to publicize technologies developed by PARC that are ready for dissemination.

Twenty-two agreements between PARC and agribusinesses have been put in place to disseminate technology or to solve a specific problem of agribusiness. A list of these agreements and technologies is contained in Appendix 13. A

number of technologies produced by research are being produced and sold by agribusinesses.

In 1990 the PROS-I and Pakistani consultant, Dr. Mahbub Ali, began work to establish a Seed Improvement Association in the private sector in Punjab based on the model of the private seed improvement associations in the United States. If this effort succeeds, the association will be a model that can be replicated in other parts of Pakistan.

The private sector is making more and more demands of the research establishments. For example in 1992 a field day on citrus production was jointly sponsored by Cargill, PARC, and the Punjab Department of Agriculture. This was inspired by Cargill's desire to boost citrus production to increase supply for their juicing plant at Sargodha. A true "win-win" situation. Similar events have taken place involving banana production, forage production, and no-till planting of wheat into rice stubble.

However, at the end of the Winrock contract period the Directorate of Agribusiness Relations was very nearly dormant. One reason was that the dynamic Agribusiness Specialist made available to PARC by Winrock was hired by USAID to be the Program Specialist for the MART project. (Currently he is USAID MART Project Officer.) A replacement Agribusiness Specialist was hired by Winrock but his position with Winrock was terminated near the end of Winrock's contract period, and PARC was unable to hire him. Another reason for the apparent dormancy is that there are only two PARC staff manning the Directorate. The Director, a recent employee of PARC, also holds the additional charge of Member Social Science. The Deputy Director is a BPS-18 employee. The Directorate's viewpoint appears to be that once an agreement between PARC and agribusiness is signed, its job is finished. Without committed, aggressive personnel in the Directorate of Agribusiness Relations there is little chance of it being productive. It is recommended that the PARC Chairman review the staffing of this Directorate and, if appropriate, appoint committed, motivated persons to the Director's and Assistant Director's positions.

4.0 LESSONS LEARNED

When Winrock began to implement its component of the MART Project, three major problem areas were immediately apparent. First, the project design incorporated a number of goals that could not be accomplished. Second, the primary GOP executing agency, PARC, did not accept a number of the objectives described in the Project Paper and perceived all implementation plans to be negotiable. Third, there was no mechanism within PARC or other entities of the research system to ensure that recommendations made were followed up, decisions taken to accept or reject the recommendations, and most important, that those recommendations accepted were actually put into effect. These problem areas mainly affected the Research Management and Administration component. The Farming Systems Research, Information Transfer, and Training for the Agricultural Research Network components were much more clearly described, were more constricted in scope, and were straightforward tasks that could be implemented with relative ease.

A further hindrance to greater progress in implementing this project was a high rate of turnover in key Pakistani personnel. Regretfully, this appears to be the norm rather then the exception in developing countries.

Lesson I

Projects should be carefully designed to include only those objectives that can be achieved. For example one of the systems analyses to be carried out in the first few months of the project was described in the PP as an in-depth study of, "Organization and Administration: methods of financial and personnel allocations, decision-making processes, standard operating procedures, administrative reporting, and channels of communication between research entities at the Federal and Provincial levels, among those at the Provincial level, and among units within individual research organizations." And there were four other equally comprehensive systems analyses described. Even if the PARC Chairman had not declined to undertake the systems analyses, it is doubtful that they could have been carried out, simultaneously, in the first 12-18 months of the project as described in the PP. Had they been

undertaken it is doubtful that they would have provided accurate information on such all-embracing subjects.

Other examples: project outputs in the PP included the following:

> "management improvement interventions designed and implemented throughout the national agricultural network in the areas of research planning, research methods, organization and administration, information flow, and financial management;"

and,

> "a revised and improved financial records maintenance and reporting system established at PARC and the Provincial agriculture research institutes;"

Winrock was capable of designing improved procedures, in identifying management practices that needed to be changed, and in recommending changes that would improve the management system. But Winrock clearly was not able to implement those changes.

Lesson II

The cooperating government and the donor agency should be in clear agreement regarding project objectives and implementation strategy, before the project is initiated. This was not the case with the MART/Winrock Project. One small example: the PP called for PARC to provide additional staff for the expanded NARC Training Institute. Quoting from the PP -- "The GOP will hire an additional 14 staff members at the NARC training facility as follows: 6 Scientific Officers (2 each in English Language, Evaluation, and Training); 2 Administrative Assistants; 2 Junior Assistants; and 4 Drivers." PARC's management had no intention of adding 14 staff to the Training Institute. In their view this was an excessive number of staff. This was not a case of not being able to provide the staff; it was a case of not agreeing with the implementation plan described in the PP. Described earlier was PARC's disagreement with the systems analyses strategy. PARC not only thought the analyses to be unworkable but did not accept them as part of the implementation strategy of the project's activities toward achieving project goals.

How is it possible to ensure that the cooperating government's implementing agency understands the project's objectives and implementation plans, that there is agreement, and that the plans will be put into effect? Perhaps there is no good answer to that question. The only suggestion that can be made here is the obvious one: that the donor agency and the cooperating government implementing agency engage in sufficient dialogue so that the details of the project are clearly understood by both parties.

Lesson III

For Winrock the most disappointing, and certainly the most frustrating, aspect of the MART Project implementation was the lack of follow-up by Pakistani institutions of sound recommendations. Two can be cited as examples. One of the first requests of Winrock was for assistance in helping PARC to collect into one volume all its policies and administrative directives. Such a publication would be exceedingly valuable in helping PARC employees understand PARC operating procedures. This volume was completed in 1987 by a Winrock ST consultant. To this writers's knowledge no steps have been taken to further utilize this collection of administrative directives.

Another example was the incisive review of NARC's management by a team of four Pakistanis and one Briton. The recommendations of this review were debated at great length by PARC/NARC committees, and a number of decisions were taken to implement several recommendations. et, very few of these decisions were actually put into practice. Why? One reason was that most of the time there was no effective leadership at NARC -- except for a period of about 13 months the NARC DG's post was held as an additional charge by three different persons during the Winrock contract period. Another reason was that there was no monitoring and evaluation capacity in PARC/NARC, no mechanism to ensure that decisions taken are actually put into action. This was the position even though a series of excellent recommendations on this subject were presented to PARC by a highly qualified consultant, Dr. Tilo Ulbricht (who also was a member of the NARC management review team).

Lesson IV

For technical assistance to be successful the recipient must sincerely want to accomplish, and must believe it possible to accomplish, whatever is being attempted. In the Research Management and Administration component these conditions often did not prevail. Most proposed management interventions, especially those pertaining to financial and personnel management, were perceived by most Pakistani research managers to be impossible to bring about, with the result that only USAID and Winrock staff pushed these reforms. On the other hand when the changes were seen to be possible and when they were desired and needed, Pakistani managers aggressively sought them. Examples: computerizing PARC financial accounts; computer training; and the provision of new physical facilities and equipment for the AVC unit and the Training Institute at NARC.

Lesson V

For technical assistance to be successful the recipient must sincerely want to accomplish, and must believe it possible to accomplish, whatever is being attempted. In the Research Management and Administration component these conditions often did not prevail. Most proposed management interventions, especially those pertaining to financial and personnel management, were perceived by most Pakistani research managers to be impossible to bring about, with the result that only USAID and Winrock staff pushed these reforms. On the other hand when the changes were seen to be possible and when they were desired and needed, Pakistani managers aggressively sought them. Examples: computerizing PARC financial accounts; computer training; and the provision of new physical facilities and equipment for the AVC unit and the Training Institute at NARC.

5.0 SUMMARY OF RECOMMENDATIONS

PARC/NARC

Continue, and intensify, efforts to convince GOP to increase funding of agricultural research to acceptable levels. Without adequate GOP. funding the national agricultural research system will not be sustainable after donor funding ends. In these efforts the results of the Evenson study (PARC, 1991) will he helpful. Also helpful would be to continue to improve the productivity of NARC and other PARC research stations.

Establish a system in the Chairman's Secretariat that will ensure the formal notification of all decisions taken by PARC, and including a mechanism to monitor, on a regular basis, the actions taken as a result of the official notifications. A "ticker" file might be helpful -- a pre-dated file giving specific dates for checking on actions taken, as of that date, to put specific decisions into action.

Review the National Coordinated Research Programs (see York report, June 87), implement acceptable recommendations, and increase funding of the NCRPs.

Review the current FSR program to determine if it is on the right course. Is it doing research or extension work? Does it need to be reoriented? Is FSR needed? Is it sustainable? If FSR is to be continued, it needs to institutionalized, the women's component strengthened, and FSR concepts taught in universities.

Consider reorganizing communications-training-outreach activities at NARC by placing them under one high-ranking officer located at NARC. This would include the current units of Scientific Information (Library and Documentation), AVC, News and Public Relations, and Training Institute.

Prepare an administrative manual based on the report of Maj. (Rtd.) M.A. Qureshi, "PARC Policies and Administrative Directives" (June, 1987).

Prepare job descriptions for all staff.

Update databases on institutions and personnel. Consider locating these databases in the Directorate of Planning.

Energize the Directorate of Agribusiness Relations by appointing motivated staff, charging the Directorate to produce increasing results, and providing reasonable funding.

Review John Wood's report of October, 1990, and decide whether to accept or reject the recommendations (especially the re-entry program) for PARC's NILTA and NARC's Training Institute.

NARC

Review Khattak report (1988) and implement approved recommendations.

Review NARC Master Plan, update, re-prioritize research projects, reallocate funds to most important projects, close out least important.

Make certain the computerized accounting system is fully utilized .

Review maintenance procedures (buildings, vehicles, equipment) and strengthen by reorganization, training of personnel, and allocation of adequate funds. (See report of Masood, Anjum, and Qureshi, May, 1990.)

Hire more staff for the AVC Unit and provide training.

Put AVC on a firm production schedule.

Revitalize the National Technical Information Transfer Committee and the Provincial Information Transfer Committees.

Continue and intensify training in library technology for the staffs of the 21 libraries.

Continue and internsify training in Computer Graphics/Desk Top Publishing.

Review the F.C. Byrnes report (Sept, 1988) and the John Woods report (Oct, 1990) regarding the future development of the Training Institute and activate acceptable recommendations.

Provinces

Set up regular in-house training programs at each research institute -- fully utilize the Training Coordinators.

Winrock

Strive to provide the most highly qualified staff, both LT and ST, for development projects. If possible, involve the Winrock Chief of Party in selection of other staff.

USAID

Reconsider the importance of agriculture and agricultural development in the overall process of economic development in countries with emerging economies.

Appendix 1

SUMMARY OF WINROCK'S BUDGETS AND ANNUAL EXPENDITURES

FINANCIAL SUMMARY 1986/87 (US $)
(JULY 1 - JUNE 30)

LINE ITEM	BUDGET	EXPENDITURE (CUMULATIVE)	PERCENT EXPENDED (CUMULATIVE)
SALARIES	1,018,411.00	223,378.48	21.93
FRINGE BENEFITS	301,354.00	71,003.10	23.56
OVERHEAD	897,933.00	141,863.51	15.80
CONSULTANTS	554,427.00	25,329.40	4.57
TRAVEL & PERDIEM	762,865.00	101,394.93	13.29
ALLOWANCES	253,935.00	52,074.01	20.51
EXPENDABLE SUPPLIES	10,000.00	1,046.04	10.46
SUBCONTRACTS	257,715.00	145,417.60	56.43
OTHER DIRECT COSTS	41,137.00	6,167.03	14.99
TOTAL	4,097,777.00	767,674.10	18.73

FINANCIAL SUMMARY 1987/88 (US$)*
(JULY 1 - JUNE 30)

SALARIES AND WAGES	1,018,411.00	508,326.40	49.91
FRINGE BENEFITS	301,354.00	161,975.85	53.75
OVERHEAD	897,933.00	360,050.78	40.10
CONSULTANTS	554,427.00	122,971.37	22.18
TRAVEL & PERDIEM	762,865.00	233,001.63	30.54
ALLOWANCES	253,935.00	113,954.46	44.88
COMMODITIES, EQUIPMENT OFFICE & FIELD EXPENSES	302,400.00	58,019.27	19.19
PROCUREMENT SERVICES	15,600.00	0	0.00
LOCAL TRAINING	30,000.00	572.72	1.91
STUDIES AND RESEARCH	20,000.00	0	0.00
SUBCONTRACTS	257,715.00	292,361.17	113.44
OTHER DIRECT COSTS	41,137.00	55,732.80	135.48
TOTAL	4,455,777.00	1,906,966.45	42.80

* FUNDING LEVEL INCREASED (CONTRACT AMENDMENT # 2)

Appendix 1

FINANCIAL SUMMARY 1988/89 (US $)*
(JULY 1 - JUNE 30)

LINE ITEM	BUDGET	EXPENDITURE (CUMULATIVE)	PERCENT EXPENDED (CUMULATIVE)
SALARIES AND WAGES	975,749.00	750,097.82	76.87
FRINGE BENEFITS	305,491.00	242,949.71	79.53
OVERHEAD	774,323.00	618,379.75	79.86
CONSULTANTS	439,349.00	333,530.54	75.91
TRAVEL & PERDIEM	726,750.00	425,259.08	58.52
ALLOWANCES	209,949.00	165,123.26	78.65
COMMODITIES, EQUIPMENT OFFICE & FIELD EXPENSES	318,000.00	223,043.35	70.14
PROCUREMENT SERVICES	15,600.00	0.00	0.00
LOCAL TRAINING	30,000.00	21,075.59	70.25
STUDIES AND RESEARCH	20,000.00	7,707.20	38.54
SUBCONTRACTS	579,280.00	498,855.81	86.12
OTHER DIRECT COSTS	61,286.00	53,798.18	87.78
TOTAL	4,455,777.00	3,339,820.29	74.95

*REARRANGED LINE ITEMS (CONTRACT AMENDMENT # 3)

FINANCIAL SUMMARY 1989/90 (US$)**
(JULY 1 - JUNE 30)

SALARIES AND WAGES	1,223,494.00	1,014,074.66	82.88
FRINGE BENEFITS	389,364.00	326,873.83	83.95
OVERHEAD	1,152,178.00	972,050.93	84.37
CONSULTANTS	823,173.00	529,325.19	64.30
TRAVEL & PERDIEM	1,289,922.00	595,270.27	46.15
ALLOWANCES	272,132.00	216,582.27	79.59
COMMODITIES, EQUIPMENT OFFICE & FIELD EXPENSES	431,398.00	322,736.69	74.81
PROCUREMENT SERVICES	22,598.00	16,905.92	74.81
LOCAL TRAINING	60,000.00	39,283.65	65.47
STUDIES AND RESEARCH	50,000.00	11,933.51	23.87
SUBCONTRACTS	1,093,964.00	733,657.57	67.06
OTHER DIRECT COSTS	105,858.00	80,084.75	75.65
TOTAL	6,914,081.00	4,858,779.24	70.27

**FUNDING LEVEL INCREASED (CONTRACT AMENDMENT # 4)

Appendix 1

FINANCIAL SUMMARY 1990/91 (US$)*
(JULY 1 - JUNE 30)

LINE ITEM	BUDGET	EXPENDITURE (CUMULATIVE)	PERCENT EXPENDED (CUMULATIVE)
SALARIES AND WAGES	1,314,778.00	1,247,486.07	94.88
FRINGE BENEFITS	415,837.00	400,559.82	96.33
OVERHEAD	1,246,101.00	1,174,343.70	94.24
CONSULTANTS	753,737.00	753,737.00	100.00
TRAVEL & PERDIEM	905,856.00	801,436.56	88.47
ALLOWANCES	292,842.00	251,764.03	85.97
COMMODITIES, EQUIPMENT OFFICE & FIELD EXPENSES	711,498.00	609,031.12	85.60
PROCUREMENT SERVICES	33,498.00	31,388.89	93.70
LOCAL TRAINING	93,443.00	71,095.78	76.08
STUDIES AND RESEARCH	50,000.00	32,993.69	65.99
SUBCONTRACTS	1,009,964.00	905,164.45	89.62
LOCAL STAFF SALARIES	104,927.00	52,354.90	49.90
OTHER DIRECT COSTS	181,705.00	126,604.42	69.68
TOTAL	7,114,186.00	6,457,960.43	90.78

*FUNDING LEVEL INCREASED (CONTRACT AMENDMENT # 6)

FINANCIAL SUMMARY 1991/92 (US$)**
(JULY 1 - JUNE 30)

SALARIES AND WAGES	1,473,903.00	1,451,508.19	98.48
FRINGE BENEFITS	468,550.00	453,835.00	96.86
OVERHEAD	1,383,041.00	1,355,941.00	98.04
CONSULTANTS	835,377.00	701,240.95	83.94
TRAVEL & PERDIEM	1,076,279.00	945,678.76	87.87
ALLOWANCES	322,930.00	294,601.74	91.23
COMMODITIES, EQUIPMENT OFFICE & FIELD EXPENSES	786,498.00	742,274.00	94.38
PROCUREMENT SERVICES	38,598.00	35,949.34	93.14
LOCAL TRAINING	108,443.00	72,281.44	66.65
STUDIES AND RESEARCH	65,000.00	44,918.81	69.11
SUBCONTRACTS	1,038,680.00	1,019,154.74	98.12
LOCAL STAFF SALARIES	274,077.00	151,013.44	55.10
OTHER DIRECT COSTS	252,595.00	184,387.00	73.00
TOTAL	8,123,971.00	7,452,784.41	91.74

**FUNDING LEVEL INCREASED (CONT. AMDTS. # 10 & 11)

Appendix 1

FINANCIAL SUMMARY 1992/93 (AS OF MAY 31/93) (US$)*

LINE ITEM	BUDGET	EXPENDITURE (CUMULATIVE)	PERCENT EXPENDED (CUMULATIVE)
SALARIES AND WAGES	1,561,479.00	1,550,392.89	99.29
FRINGE BENEFITS	485,060.00	480,911.74	99.14
OVERHEAD	1,440,105.00	1,429,992.14	99.30
CONSULTANTS	719,785.00	719,897.73	100.02
TRAVEL & PERDIEM	1,056,027.00	1,020,970.98	96.68
ALLOWANCES	319,092.00	316,342.93	99.14
COMMODITIES,EQUIPMENT OFFICE & FIELD EXP	830,076.00	810,319.66	97.62
PROCUREMENT SERVICES	39,799.00	39,307.58	98.77
LOCAL TRAINING	72,498.00	72,498.34	100.00
STUDIES AND RESEARCH	49,253.00	50,907.65	103.36
SUBCONTRACTS	1,028,155.00	1,025,101.32	99.70
LOCAL STAFF SALARIES	290,545.00	286,121.30	98.48
OTHER DIRECT COSTS	232,097.00	219,011.56	94.36
TOTAL	8,123,971.00	8,021,775.82	98.74

*REARRANGED LINE ITEMS (CONTRACT AMENDMENT # 15)

CONCLUSIONS AND RECOMMENDATIONS

From the Mid-Term Evaluation Report, February 1989

A. Current Status of Project

The project provides necessary and desired support to a national agricultural research system whose products are sorely needed to attain production targets. The project is close to being on schedule inputs have been delivered on time, and managed to produce programmed outputs. Some delays have occurred in in-country training, which has focussed more on technical matters than on management. The impact of new elements added by MART, e.g., FSR and communications, and that of international training, cannot be expected until fully integrated. Procurement and commissioning of laboratory equipment has led to some aggravation. The time required for review and decision on study recommendations was underestimated. Otherwise, project implementation appears to be well managed, on track, and relatively free from implementation problems.

Nevertheless, substantial progress will be less than hoped for, in the 12 measures of end-of-project status at the current (extended) PACD, even with the additional time and resources currently being considered. Most of the management problems identified stem from two sources beyond the effective influence of MART. First, the provinces' independent responsibility for agriculture constitutes a federal system of research, similar to that of the United States. It is an alliance rather than a controlled organization, so changes must be brought about by consensus, which takes considerable time and effort to develop. Second, inflexible public sector management systems are not readily modified, even by autonomy. Staff are unwilling to risk their careers by innovation in arcane areas. In this environment, MART is a necessary but insufficient response.

It should be noted that, despite these problems, agricultural research has been able to produce or adapt the technology needed to keep agriculture growing at 3.6 percent/

year for 25 years. Improvements in management of the research system are intended to increase its efficiency and cost effectiveness to assure a continuation in growth.

The MART Project design is seriously flawed by expectations that are quite unrealistic in light of the size and nature of the problems faced. Many of the proposed interventions (specifically the systems analyses and many of the covenanted studies) were inappropriate for the type of problems described above. The indicators of EOP status were presented without baseline or targets. The level of effort allotted for technical assistance for management and administration was infinitely small in relation to the extent and dispersion of the system.

The sequencing, as well as the total time allowed for other project inputs to affect EOP status, are incongruous. Most degree candidates will not have returned to the project long enough for the impact of their training to be felt. Equipment provided in 1988 will have little immediate impact on science. Output of the information transfer component must await the building of a center, the purchase of equipment for that center, and the hiring and training of staff upon its completion.

USAID, PARC, and the contractors have nevertheless managed with flexibility to achieve significant progress towards the ends of the project. The fact that MART will not reach full EOP status by PACD is more of a design problem than an implementation concern.

At this point in time, the Pakistan national agricultural research system continues to be a loose alliance rather than an integrated national system. PARC strategy for strengthening the cohesiveness of the alliance has three elements: (1) scientific excellence in the performance of its controlled elements; (2) the provision of useful services to the system; and (3) the ability to acquire resources for and represent the system. They are doing a good job in all three areas, and donor assistance has provided material assistance and encouragement in all three.

NARC has become a center of excellence in little more than a decade. Its laboratories, library, and equipment repair units provide needed services to other parts of the system. A draft long-range research plan involved the entire scientific staff in its development, providing experience in setting goals, establishing priorities, and allocating resources. Other organizations are seeking to emulate this example. PARC's computerized accounting and management information systems, when operative, are expected to become other models. Its adoption of a system of promotion based on objective indicators of performance instead of seniority is an example we hope other organizations will adopt.

The national coordinated research programs, usually along commodity lines, bring together researchers with similar interests to exchange information, determine priorities, and allocate responsibilities and resources. The PARC budget provides support complementing the provincial institutes' manpower and facilities. Although these programs represent a small portion of the total resources, they are particularly useful in establishing cohesiveness.

PARC has been very successful in attracting the support of donors, who share its views about the need for an integrated system. Although these donors have helped build up PARC and NARC, significant flows of resources have been channelled to the provinces, an indicator of PARC's responsibility for aiding the system as a whole.

PARC has been less successful in raising domestic resources. While agricultural research has obtained its share, and more, of the budget, Pakistan's low revenue growth constrains research budgets as well, at both national and provincial levels. This situation is not apt to improve significantly in the near term.

Although its recurrent budget has apparently grown at a compounded rate of 25 percent over the last 5 years, personnel costs with inflation have grown even faster, so that operating funds for research per scientist have actually declined by more than half. Clearly, excellence has its costs.

The disparity between financial trends and operating requirements makes the strengthening of management capabilities even more important if research is to be cost effective. Management must be strengthened in all components to meet the challenge of better science with continuing austerity. The components include: (1) careful allocation of resources to well-planned research programs directed at high priority problems, and elimination of repetitive studies of less importance; (2) tight management of research operations, enforced by good program monitoring and evaluation; (3) personnel management practices that reallocate and/or retrain scientists to meet program needs, and assure through job descriptions and supervision that they understand what is expected of them; (4) effective financial management so that resources flow to experiments when needed under effective controls; and (5) realignment of organizational structures for organizational development and change.

Short-term training and consultation activities in MART should be refocussed to emphasize these management fields rather than technical subjects. PARC should strengthen the management of its own organizations along the same lines. Its leadership role in management is as important as its scientific excellence, since other organizations in the system need working models to emulate.

B. Recommendations

The following recommendations are summarized from information provided in the assessment of individual components and in other sections of the report. They are not prioritized, but are believed to be the most important feasible actions that can be taken in each area. Other recommendations and suggestions are included throughout the report.

1. Management

PARC has been given a substantial degree of autonomy, but has been slow to break away from the bureaucratic system. For the progress of Pakistan's agricultural prosperity, all

research institutes need the delegation of administrative and financial authority. In spite of discouragingly slow progress, donors should continue to press for genuine autonomy for the research organizations they are assisting. We recommend that in the meantime PARC should get on with the essential steps that lie entirely within its authority. Specifically:

- Review, decide and implement the recommendations of the Khattak and York reports.

- Publish and distribute PARC/PAD after review to remove discrepancies.

- Institutionalize job descriptions for all professional staff, prepared and negotiated at all supervisory levels

- Initiate a comprehensive training program for all supervisory levels in supervision and personnel management techniques, program planning, budgeting and monitoring, and principles of organizational development and change. This basic training is essential to build the confidence, responsibility and authority of the management cadre.

- Undertake a very careful investigation of the management systems of the public sector to determine the areas of flexibility within that system and use it to inform all levels of management of the limits and range of their authorities.

- Encourage other organizations to emulate the PARC/NARC example of promotion based on performance rather than seniority.

- Strengthen the PARC Project Implementation Unit through advisory assistance to help develop a computerized monitoring and reporting system. A study tour to Egypt to observe the PIU established

by the GOE Agricultural Research Center for the National Agricultural Research Program would be useful.

2. Information Transfer

a. Status

This component has probably been the most successful because the goals were clearly specified, the technical assistance was of high quality, and PARC was fully committed to developing this program. The Multi-Media Production Center is under construction, the equipment is available or on order, a skeletal staff under a competent but inexperienced director is undertaking a practicum, information transfer training courses have been given to 250 individuals at national and provincial levels, and a Technical Transfer Coordination Committee is functioning. Considerable effort has been given to improving library information search capability, including bibliographic reference summaries.

b. Recommendations

- Additional staff must be recruited as the Multi-Media Production Center nears completion.
- The assignment of the information transfer advisor should be extended until at least June 1990, until the center is operational.
- The incipient inventory of people, programs and resources available for work in information transfer at federal and provincial levels should be formalized.
- Data base compatibility among library bibliographic programs should be assured, as well as in other areas where data bases and specialized computer programs are being developed.

- Overseas degree training should be provided for five to nine participants from national and provincial levels in agricultural communications.

- Over the long run, a balanced information focus is needed, with first priority given to serving scientists, but with attention also given to technical transfer to intermediate groups and to information for GOP decision-makers on the value of science to agriculture.

3. Training

a. Status

The participant training program is on track. Considerable documentation has been prepared to orient participants going to the United States for degree programs. The PARC Training Directorate has established a valuable computerized data base with information on participants overseas. Work is under way on constructing the addition to NARC Training Institute facilities. Seventy short courses have been conducted in-country under the MART Project. This component has had difficulties related to unclear goals in the PP/PC-1, resignation of the long-term advisor, and a general lack of understanding of the professional training/human resources development field.

b. Recommendations

- The issues raised and recommendations made in Frank Byrnes' report should be digested and acted upon as soon as possible. PARC should provide leadership for agricultural research in the human resources development field. In doing so, it should make expanded use of innovative approaches, including recurrent TDYs, twinning arrangements with foreign institutions, and organizational development and change concepts.

- High priority should be given to implementing a re-entry program for returning scholars and expanding the PARC Training Directorate data base.

- A consultant should be brought in as soon as possible to help analyze the accumulated survey data, with priority given to developing institutional profiles. A national training plan should not be attempted at this time. Emphasis should be given to training plans for individual institutions, with priority given to NARC and The Agricultural University, Faislabad.

- PARC should establish a model computerized personnel data base that can be used by other research institutions and agricultural universities, providing a compatible system.

- A systematic in-service training program is essential throughout the system. NARC's in-service capacity should be improved and used to assist provincial institutes and universities to organize and conduct this type of training.

- International participant training needs include three Ph.Ds. in continuing education-HRD management; five M.Sc.s in continuing education-teaching methods' and three trainers per year for short courses in training of trainers.

EXECUTIVE SUMMARY

from Second Midterm Evaluation Report, March, 1993

A. Background

U.S. assistance to Pakistan's to agricultural research system has been continuous since 1969. The Management of Agricultural of 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 institute 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 institute. The intent was to focus on agricultural research priorities as defined by businsessmen and farmers, and the subcomponents were designed to facilitate this interaction.

The Pressler Amendment was activated in Pakistan 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 project 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 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, 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,m 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 institute, 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 Program (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 pondersome 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 then 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 form 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 supped 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.

LEMRU. A laboratory equipment maintenance and repair unit is in operation.

Competitive research grants. This BOSTID-managed effort allocated 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 for 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 Program (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 Program (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 Pakistan 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, it required.

NARC master plan. PARC, NARC, and selected scientists from provincial institutions should again review the master plan to assure optimizing resources use and complementarily 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 inter-face 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 scientist 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 or training, encouraging joint research-agribusiness partnerships, and properly maintaining laboratory equipment.

Appendix 4

LIST OF MART/WINROCK LONG TERM TECHNICAL ASSISTANCE
(Man months)

No.	Name	Assignment	Arrival	T.Period (Man months)
1.	Dr. Bill C. Wright Chief of Party	Research Management and Administration	Jun 30,86	69
2.	Dr.Murray D. Dawson	Farming System Research, NARC Master Plan	Jul 01,86	48
3.	Dr. J. Cordell Hatch	Information Transfer	Jul 18,86	69
4.	Dr. Takumi Izuno	PROS-I	Sep 15,86	80
5.	Dr. Theodore Buila	Training for the Agricultural Research Network	Sep 08,86	24
6.	Dr. James B.Barnett	PROS-II	Nov 03,89	19

Appendix 5

LIST OF LOCALLY-HIRED CONSULTANTS

S/No.	Name	Purpose	Duration	
			From	To
1.	Dr. Mumtaz Ahmad	Survey Agribusiness Sector	02-01-87	04-30-87
2.	Major M.A. Qureshi	Public PARC Policy and Administrative Directives	03-15-87	06-30-87
3.	Mian Hidayat Ullah	Prepare for Women in FSR National Workshop	03-15-87 11-01-87	07-14-87 02-15-88
4.	Malik Riaz-ur-Rahman	Write radio scripts	05-03-87	09-30-87
5.	Sajjad Mirza	Assist NARC Master Plan peparation	10-13-87	05-15-87
6.	Farzana Masood	Women in FSR Specialist	10-25-87 02-02-88	02-01-89 07-24-89
7.	Nabila Ayaz	Analyze personnel and institutional data	07-01-88	
8.	Syed Iqbal Mustafa	Plan Vehari Agriculture Development Center with John Woods	07-01-88	08-31-88

9.	Syed Shahid Afzal	Technical Systems Specialist	12-02-88	06-30-92
10.	M. Ashraf Chaudhry	Farm Machinery Specialist	01-22-89	07-19-90
11.	M. Bashir Chaudhry	help conduct review of Soil Department of FAU	01-29-89	02-16-89
12.	Zafar Iqbal	Training course in several softwares	02-01-89	03-31-89
13.	Mahbood Ali	Help teach short course on organization & implementation of research	06-03-89	06-22-89
14.	Abdus Salam Akhtar	Help teach research management short course	06-10-89	06-22-89
15.	Asghar Jalis	Prepare script for FSR TV modules	07-18-89	03-31-93
16.	Bushra Tariq	Women in FSR Specialist	09-01-89	03-31-93
17.	Iftikhar Malik	Production of Radio Programs	01-11-90	01-30-90
18.	Faisal Javed	Production of Radio Programs	01-11-90	01-30-90
19.	Daud Ahmed Khan	Horticulture Specialist with FSR	01-23-90	12-31-90

Appendix 5

20.	Col. Masood A. Khan	Review NARC maintenance management	02-10-90	02-20-90
21.	Abdus Salam Akhtar	Help teach research management short course	02-12-90	03-01-90
22.	M. Khalid	Agribusiness Specialist	09-15-90	04-30-92
23.	Waheed Ahmad	Help teach short course on research management	11-26-90	12-17-90
24.	Mahboob Ali	Establishment of Seed Improvement Association	06-10-91	09-30-91
25.	Daud Ahmed Khan	Horticulture Specialist with FSR	08-10-91	09-30-91
26.	M. Shafi Nazamani	Help organize short training course on Planning, Analysis & Interpretation of of Agriculture Experiments	08-17-91	08-29-91
27.	A. Karim Akbani	- do -	- do -	
28.	Chaudhry Nazir Ahmad	- do -	- do -	
29.	Abid Hussain Khawaja	AV short term training	11-23-91	11-29-91

30.	M. Ajmal Makhdoom	Study motivation of NARC scientists	01-08-92	04-07-92
31.	Nazir A. Chaudhry	Review of Consultancy Reports	04-09-92	08-08-92
32.	M. Sarwar Anjum	Agribusiness Specialist	06-16-92	03-31-93

Appendix 6

LIST OF MART/WINROCK INTERNATIONAL SHORT TERM CONSULTANTS

S/No.	Name	Purpose	From	To
1986				
1.	Bill C. Wright	Project Planning	05-05-86	05-12-86
2.	James Miller (1)	NARC Building Design	06-04-86	06-19-86
3.	James Miller (2)	NARC Building Design	07-24-86	08-15-86
4.	E.T. York	Research/Extension Coordination	08-27-86	09-18-86
1987				
5.	James Miller (3)	NARC Building Design	01-05-87	01-19-87
6.	Pervaiz Amir	FSR Training	02-02-87	02-21-87
7.	Anita Frio	FSR Training	02-02-87	02-21-87
8.	Jim Bemis	AVC Training	02-02-87	02-21-87
9.	E.T. York	Research Coordination	02-22-87	03-15-87
10.	John De Boer	FSR Training	04-05-87	04-12-87
11.	Pervaiz Amir	Farming System Research	04-06-87	04-17-87
12.	I.E. Coop	FSR Training (sheep mgt)	04-06-87	04-16-87
13.	James Miller (4)	NARC Building Design	08-10-87	08-24-87
14.	Edward Mallorie	FSR Data Handling and Analysis Workshop	04-05-87	04-15-87
15.	Edward Mallorie	-do-	10-04-87	12-20-87
16.	Richard Hamilton	Tropical Horticulture	10-20-87	11-12-87

17.	R. Nelson	Barani Area Research and Education	11-08-87	12-05-87
18.	F. Bolton	-do-	11-08-87	12-05-87
19.	Gomez K.A.	Short course on FSR Statistics and Experimental Design	12-07-87	12-05-87
20.	Ted Hutchcroft	AVC Training	11-01-87	11-04-87
1988				
21.	Michael Greene	Proposal Preparation Workshops	01-13-88	01-27-88
22.	Robert Evenson	Research Investment Project	01-15-88	01-23-88
23.	Edward Mallorie	FSR Data Handling and Analysis Workshop	01-27-88	04-20-88
24.	Delmar Hatesohl	Teach Science Writing Course	01-30-88	03-04-88
25.	Larry Boersma	Role of Soil Physics in Agronomic Research	02-18-88	03-04-88
26.	Kenn Swann	Prepare and teach TV module production	02-20-88	04-02-88
27.	Loy Crowder	Fodder Crop Research in Pakistan	03-10-88	04-10-88
28.	Robert Evenson	Research Investment Evaluation Project	03-11-88	03-25-88
29.	Richard Goldman	Role, Training Program and Research Agenda for Social Sciences Division	03-24-88	04-08-88

Appendix 6

30.	Melvin R. George	Strengthening of Agriculture Libraries	06-02-88	06-30-88
31.	John L. Woods	Establishing Regional Agriculture Economic Development Center at Vehari	06-15-88	07-15-88
32.	David L. Creech	Temperate Fruit Horticulture	06-18-88	07-18-88
33.	Roger G. Peterson	Biometery in Pakistan	06-20-88	09-15-88
34.	Wayne Freeman	Planning for Management Training	07-05-88	07-15-88
35.	Douglas Gollin	Data Collection for Evaluation of Investment in Agriculture Research	07-06-88	07-17-88
36.	Harry Carey	AVC Training	07-08-88	07-24-88
37.	Robert Evenson	Research Investment	07-19-88	08-04-88
38.	Melvin R. George	Strengthening of Agriculture Libraries	07-27-88	08-31-88
39.	Colin A. McLung	Research Master Plan for NARC	08-06-88	08-20-88
40.	James Miller (5)	NARC Master Plan	08-08-88	08-20-88
41.	Francis C. Byrnes	Planning for NARC/TI future activities	09-04-88	10-01-88
42.	Ernest W. Nunn	Training for the Support of Agriculture Field and Greenhouse Research in Pakistan	09-20-88	10-04-88

43.	Ludwig M. Eisgruber	NARC Research Master Plan	09-25-88	10-06-88
44.	Colin A. McClung	-do-	09-25-88	10-06-88
45.	Travis R. Everett	Integrated Pest Management in Pakistan with a focus on Vehari Agric. Economic Development Center	25-10-88	11-25-88
46.	Steven Breth	Editing the NARC Master Plan	11-01-88	11-11-88
1989				
47.	Larry Boersma	Review of Department of Soil Sciences of UAF	01-10-89	02-20-89
48.	Parker F. Pratt	Review of Department of Soil Sciences of UAF	01-28-89	02-18-89
49.	J. Walter Kender	Review Citrus Research in Pakistan	01-20-89	02-10-89
50.	Robert L. Fox	Review Soil Fertility Research at SAU	01-20-89	02-17-89
51.	Leonard R. Mattick	Scientific Operation and Maintenance training	01-20-89	03-06-89
52.	Hugh Thomas	Strengthening Cytogenetics and Plant Breeding at SAU	01-27-89	02-28-89
53.	John M. Dukesbury	Manpower Data Analysis and Planning	03-01-89	03-24-89
54.	Abdel Al Zidan	The Status of Agriculutre in Makran Division	03-15-89	06-15-89
55.	Paul Ruskin	AVC Training	03-27-89	04-30-89
56.	Steve Breth	NARC Master Plan	04-18-89	05-04-89

57.	David McHaffey	Institutionalization of FSR in Pakistan	05-10-89	08-16-89
58.	John M. Dukesbury	Manpower Data Analysis and Planning	06-15-89	07-27-89
59.	Donald R. Barton	Short Course in Research Management	06-03-89	06-22-89
60.	Abdel Al Zidan	The Status of Agriculture in North West Frontier Area Development Project (NWFADP) and Tribal Areas Development Project (TADP)	07-20-89	09-29-89
61.	Robert Evenson	Research Investment Project	08-05-89	08-16-89
62.	Erik Bloom	-do-	08-05-89	08-31-89
63.	James Barnett	Incountry Training Needs: Focus on Sind & Balochistan	08-14-89	09-04-89
64.	John M. Dukesbury	Manpower Data Analysis and Planning	08-15-89	01-31-89
65.	Larry Littlefield	Training of Training Coordinators	10-31-89	11-20-89
66.	James D. White	-do-	10-31-89	11-20-89
1990				
67.	Travis P. Nicholls	New Technologies for Library and Information	01-16-90	01-31-90
68.	John M. Dukesbury	Inventory and Directory of Agricultural Research0 in Pakistan	01-26-90	03-02-90

69.	Donald W.Barton	Training in Research Management	02-08-90	03-06-90
70.	Robert E. Hudgens	Assessing the Impact of Farming System Research in Pakistan	02-12-90	03-19-90
71.	Marlin van der Veen	-do-	02-12-90	03-19-90
72.	Leonard R. Mattick	Training in Scientific Operations and Maintenance	02-15-90	04-12-90
73.	Guy B. Baird	NARC Master Plan Implementation	02-16-90	03-23-90
74.	John L. Woods	MART Training Review	02-23-90	03-23-90
75.	Larry Littlefield	Training of Training Coordinators	03-05-90	03-28-90
76.	James D. White	-do-	03-09-90	03-28-90
77.	Gurdev S. Khush	Plant Breeding Research and Teaching at SAU	03-21-90	03-26-90
78.	David Hansen	Photography/Graphics Training	03-28-90	06-01-90
79.	Karen Lilly	-do-	03-28-90	06-01-90
80.	Richard W.Tenny	Computer Application for Agriculture Information Transfer	04-22-90	04-03-90
81.	Lloyd Johnson	Experiment Station Management Training Course	05-07-90	06-09-90
82.	Murray Dawson	FSR & NARC Master Plan Implementation Report I	05-24-90	07-02-90
83.	Douglas Johnson	Increasing Local, Private Seed Production and Marketing in Pakistan	09-03-90	09-28-90

84.	Murray Dawson	FSR & NARC Master Plan Implementation Report II	09-12-90	11-07-90
85.	John L. Woods	MART Training Review Phase II, PARC Re-entry Program	09-21-90	10-10-90
86.	D. Harpstead	Short Course in Agriculture Research Planning	11-26-90	12-17-90
87.	D. Fienup	-do-	11-26-90	12-17-90
88.	R. McAdam	Follow-up of Blue Ribbon Review of UAF	11-03-90	12-09-90
89.	William C. Wagner	Review of Veterinary Sciences in Punjab	03-09-90	03-23-90
1991				
90.	Larry Littlefield	Training of Training Coordinators	01-01-91	01-14-91
91.	James D. White	-do-	01-01-91	01-14-91
92.	Robert H. Stover	Evaluation of Disease and Other Problems in the Sindh Banana Industry	07-04-91	09-06-91
93.	Marlin van der Veen	Pilot to Production Program: Planning, Monitoring and on-going Evaluation	07-16-91	08-30-91
94.	Roger G. Peterson	Statistical Support for Farming System Research	08-05-91	09-02-91

1992

95.	Wayne E. Swegle	Writing MART Report	01-03-92	01-31-92
96.	Murray Dawson	Farming System Research Report III	02-08-92	03-15-92
97.	Richard Hamilton	Tropical Horticulture Crops	09-11-92	10-11-92

Appendix 7

MART/WINROCK AND WINROCK CONSULTANT'S REPORTS

S/No.	Author	Title of Report
	1986	
1.	James Miller	NARC Facility Survey Report (1) June 1986
2.	James Miller	NARC/MART Construction Planning Interim Report (2), August 1986
3.	E.T. York	Research/Extension cooperation, Aug. - Sept. 1986
	1987	
4.	James Miller	MART Construction Planning, Report (3), Jan. 1987
6.	M. Dawson	Soil-Pasture-Animal Ecosystem, Jan. 87
7.	I. E.Coop	Commentary and Recommendations on Sheep Research in Pakistan, May, 1987
8.	E.T. York	Pakistan's National Coordinated Research Programs, June - 1987
9.	James Miller	NARC Facility Design (4), August 1987
10.	Murray Dawson & M. Sajjad Mirza	NARC Master Plan Questionnaire Analysis, August 1987

11.	Murray Dawson & M. Sajjad Mirza	Research Management Items, August 1987
12.	Richard A. Hamilton	Tropical Horticulture. A Study of Tropical Research and Production in Pakistan, November 1987
13.	K.A. Gomez & Edward Mallorie	FSR Data Handling and Analysis Workshop, December 1987
14.	Mumtaz Ahmed	Private Sector Companies and Establishments - List of Addresses December 1987
15.	Mumtaz Ahmed	Agricultural Research in Pakistan, December 1987
16.	Ralph Nelson &	Barani Area Research and Education Floyd E. Bolton December 1987
17.	M. Dawson, G.R. Sandhu	Plant Available Moisture in Pothwar M. I. Nizami Area, 1987
18	Murray Dawson & Mirza S. Naz	Barani Fodder Livestock Systems & Plant Available Moisture,1987

1988

19.	Michael P. Green	Proposal Preparation Workshop - Pakistan, Jan. 88
20.	Larry Boersma	Role of Soil Physics in Agronomic Research, March 1988
21.	Robert E. Evenson	Evaluation of Investment Research Project Phase-I, March 1988

22.	Richard H. Goldman	Suggestions Regarding the Role, Training Program, and Research Agenda for the Social Sciences Division, PARC, March 1988
23.	Loy V. Crowder	Fodder Crops Research in Pakistan, April 1988
24.	David L. Creech	Temperate Fruit Horticulture - A Study of Temperate Fruit Research and Production in Pakistan, July 1988
25	John L. Woods & Syed Iqbal Mustafa	Establishing a Regional Agricultural Economic Development Centre at Vehari, Pakistan, July - 1988
26.	Douglas Gollin	Data Collection for Evaluation of Investment in Agricultural Research, August 1988
27.	James Miller	NARC Master Planning Report (5), August 1988
28.	James Miller	Design of the AV Production Studio and Addition to the Training Institute at NARC & Development of a Physical Master Plan for NARC Consulting Reports 1-5, (June 1986 - August 1988) - August 1988
29.	Theodore Buila	End of Tour Report, August, 1988
30.	Francis C.Byrnes	Training for Agricultural Research in Pakistan, September 1988

31.	Melvin R. George	Strengthening of Agricultural Libraries in Pakistan, September, 1988
32.	Ernest W. Nunn	Training for the Support of Agricultural Field and Greenhouses Research in Pakistan, September 1988
33.	Roger G. Peterson	Biometery in Pakistan - A Review of the Current Status with Recommendations, September 1988
34.	A. Colin McClung & Ludwig M. Eisgruber	The Research Master Plan for the National Agricultural Research Centre, October 1988
35.	Travis R. Everett	Integrated Pest Management in Pakistan with a focus on the Vehari Agri. Economic Development Centre November 1988
36.	Taseer/Hadi/Khalid & Co	The Accounting Systems at University of Agriculture, Faisalabad, Dec 88
37.	Farzana Masood &	Rural Women in Pakistan Farming Mahjabeen Systems Research, Dec. 1988

1989

38.	Walter J. Kender	Citrus Research in Pakistan (Problems and Solutions), January 1989
39.	Robert L. Fox	Soil Fertility Research at Tandojam, February 1989

40.	Parker F. Pratt (T.Ldr), Bashir Chaudhry, & Larry Boersma	Review of the Department of Soil Sciences of the University of Agriculture, Faisalabad, February 1989
41.	Hugh Thomas	Strengthening Cytogenetics and Plant Breeding Teaching and Research in Sindh Province, February 1989
42.	Leonard R. Mattick	Scientific Operations and Maintenance, March 1989
43.	John M. Dukesbury	Manpower Data Analysis and Planning, April 1989
44.	Farzana Masood Mahjabeen	Rural Women in Farming Systems Research (Fatehjang), Apr. 1989
45.	M.Dawson, Yousaf Ch., Agha S. Haider, & A. Majid	Institutionalizing Farming Systems in Pakistan, May 89
46.	Abdel Al Zidan	The Status of Agriculture in Makran Division. Constraints, Solutions and Future Developments, June 1989
47.	Leonard R. Mattick & Sam Portch	Analytical Chemistry, Instrumentation and Maintenance - A Training Manual and Aid. Prepared for Bangladesh Agric. Res. Council, Reproduced for NARC July 1989
48.	John M. Dukesbury	Pakistan Agricultural Research Institutional and Manpower Data Analysis and Planning, July 1989

49.	Donald W. Barton & Abdus Salam Akhtar	A Short-course in Research Management, Sept. 1989
50.	James Barnett	In-country Training Needs: Focus on Sind and Balochistan, Sept. 1989
51.	Abdel-Al Zidan	The Status of Agriculture in North West Frontier Area Development Project (NWFADP) and Tribal Areas Development Project (TADP), - Constraints, Solutions and Future Development, Sept. 1989
52.	Larry Littlefield & James White	In-Service Training Program for Agricultural Scientists in Pakistan; Initial phase (Training of Training Coordinators), Nov. 1989
53.	John L. Woods	MART Training Review, Nov. 1989
54.	Roger G. Petersen	Experimental Designs in Agriculture, Nov. 1989
55.	Roger G. Petersen	Special Topics in Biometry, November, 1989
56.	Abdul Majid/Pervez Amir /S.H. Hanjra/M.D. Dawson	FSR in Pakistan - Recent Development & Trends, 1989
57.	James Miller	NARC Physical Master Plan 1990-2000, Vol. II, 1989

1990

58.	Paul Travis Nicholls	New Technologies for Library and Information Work, January 1990

59.	Murray Dawson	Sustainable Agriculture and Resource Conservation in Pakistan, Jan. 1990
60.	Murray Dawson	Farming Systems Research MART Project (End of Tour Report), March 31, 1990
61.	Larry Littlefield &	Training of Training Coordinators: James White Principles and Techniques of Continuing Adult Education, March 1990
62.	Gurdev S. Khush	Plant Breeding Research & Teaching at Sindh Agricultural University March 1990
63.	Donald W. Barton	A Short Course in Research Management Training, (February 17-March 1, 1990 - Faisalabad)
64.	John M. Dukesbury	Pakistan ARN (Agric. Research Network): Inventory and Directory of Institutions and Manpower Data Analysis, March 1990
65.	Robert E. Hudgens & Marlin van der Veen	Assessing the Impact of Farming System Research in Pakistan, March 1990
66.	Donald W. Barton	Training in Research Management (a manual), March 1990
67.	Donald W. Barton	Training in Research Management (training programme), March 1990

68.	Guy B. Baird	National Agric. Res. Center - Master Plan Implementation, March 1990
69.	William C. Wagner	Trip Report, The College of Veterinary Science, Lahore - The Faculty of Veterinary Science, Faisalabad; The Faculty of Animal Husbandry, Faisalabad, March 1990
70.	Murray Dawson & Abdul Majid	Management of Farming System Research Projects, March 1990
71	Abdus Salam Akhtar	Course on Training in Research Management, March 1990
72.	Richard W. Tenney	Computer Applications for Agricultural Information Transfer April 1990
73.	Leonard R. Mattick	Laboratory Instrumentation Maintenance, Repair, and Operation April, 1990
74.	Col. M. Masood Khan/ Idrees Anjum/T. Qureshi	NARC Maintenance Organizations: A Review, May 1990
75.	David Hansen/K. Lilley	Photography/Graphics Training, May 1990
76.	M. Ashraf Choudhary	Farm Machinery Research & Development of MART Project, (End of tour report), June 1990

77.	Murray Dawson	Farming Systems Research in Pakistan, Proceedings of the Conference on Institutionalization of FSR in Pakistan June 1990
78.	Loyd Johnson	Experiment Station Management Training Course, June 1990
79.	Murray Dawson	FSR & NARC Master Plan Implementation, Report I, July 1990
80.	Johnson E. Douglas, Mahbub Ali &	Increasing Local, Private Seed Production & Marketing in Pakistan, Takumi Izuno September 1990
81.	John L. Woods	MART Training Review Phase II PARC Re-entry Programme, NARC Training Institute Programme, October 1990
82.	Murray Dawson	FSR & NARC Master Plan Implementation - Report II, November 1990
83.	D.F. Fienup, D.Harpstead Waheed Ahmad	A Short Course in Agri. Research Planning, Dec. 1 - 13, 1990
84.	John M. Dukesbury	The Pakistan Agricultural Research Network (ARN), December 1990
85.	John M. Dukesbury	Inventory of Agricultural Research Institutions in Pakistan, Dec. 1990

86.	John M. Dukesbury	Directory of Agricultural Research Institutions in Pakistan, Dec. 1990

1991

87.	L.Littlefield &	Training of Training Coordinators: James White Principles and Techniques of Continuing Adult Education (Session II), January 1991
88.	R.H. Stover	Evaluation of Disease and Other Problems in the Sindh Banana Industry, July 1991
89.	Marlin Van Der Veen	Pilot to Production Programs: Planning, Monitoring and On-Going Evaluation, August 1991
90.	Marlin Van Der Veen	Farming Systems Socio-Economic Research In Pakistan, August 1991
91.	Larry Littlefield & James White	Training of Training Coordinators: Principles and Techniques of Continuing Adult Education, (Session III), July & August, 1991
92.	Marlin van der Veen	Hand Book for Data Collection and Budgeting (For Assessing The Economic Viability of New Technology Tested in On-Farm Trials), August 1991
93.	Roger G. Peterson	Statistical Support for Farming System Research (FSR) September 1991

94	James B. Barnett	Management of Agricultural Research and Technology Project, End of Tour Report, September 1991
95.	Murray Dawson	Farming Systems Research and NARC Master Plan, Report III, September 1991
96.	Roger G. Peterson	A Manual for the Design and Analysis of On-Farm Trials, September 1991
97.	James B. Barnett	Management of Agricultural Research and Technology Project, User's Guide for "Easystat", September 1991
98.	Daud A. Khan	Baghaat Ki Paidawar Main Izafa (Urdu), September 1991
9.	Marlin van der Veen/ Qasim Chatha/M. Aslam	Zero Tillage Wheat Pilot Production Programme for The Punjab, Rice-Wheat System, 1991

1992

100.	ARI, Sariab Staff and Bill C. Wright	Draft Research Plan for Agricultural Research Institute, Sariab, Quetta March 1992
101.	Murray Dawson	Farming Systems Research, March 1992
102.	Bill C. Wright,	End of Tour Report (July 1986-March 1992), March 1992
103.	Bushra Tariq	Rural Women Poultry Keeping at Fatehjang, April 1992

104. James C. Hatch	End of Tour Report, May 1992
105. Richard A. Hamilton	Some Tropical Horticultural Crops October 1992
106 M. Nazir Chaudhry	A Review of the Consultancy Reports, August 1992
107. M. Sarwar. Anjum	How to Improve the Procurement System of Non-conventional Oilseeds Under an Effective Policy Structure, December 1992

Appendix 8

LIST OF PARC PUBLICATIONS FUNDED BY MART

1987

01. MART Project - Introductory Brochure
02. Livestock in Pakistan Farming System Research
03. Plant Available Moisture in Pothwar Barani Area
04. PARC Policy and Administrative Directives (PARC PAD)

1988

05. Formats and Mechanism for Keeping & Processing Farm Records

1989

06. Women in Pakistan Farming Systems Research
07. FSR in Pakistan - Recent Developments and Trends
08. Feasibility Study of Computerizing the Accounting System of the University of Agriculture, Faisalabad
09. FSR in Pakistan - Recent Developments and Trends
10. NARC Research Master Plan 1988-2000

1990

11. Rural Women in Farming Systems Research in Fatehjang
12. Report on Computerization of PARC Accounts
13. NARC Research Master Plan
14. NARC Physical Master Plan
15. Farming Systems Research in Pakistan
16. Experimental Designs in Agriculutre
17. Special Topics in Biometry
18. NARC Financial Management Review

1991

19. Directory of Agricultural Research Institutions in Pakistan

20. Inventory of Agricultural Research Institutions in Pakistan
21. High Economic Returns from Investment in Agricultural Research
22. Handbook for Data Collection and Budgeting
23. A Manual for Design and Analysis of On-Farm Trials
24. Zero-Tillage Wheat Pilot Production Program for the Punjab Rice-Wheat System
25. Agriculture Research Productivity in Pakistan
26. Financial Handbook
27. High Economic Returns from Investment in Agricultural Research
28. Agricultural Research Productivity in Pakistan

1992

29. National Directory of Plant Pathologists
30. Phytopathological Diagnostic Techniques
31. Agricultural Library Research In Pakistan
32. Seed Borne Micro-organism in Pakistan - Checklist 1991

Appendix 9

LIST OF AGRICULTURE RESEARCH LIBRARIES
IN THE LIBRARY STRENGTHENING PROGRAM

1 Agricultural Research Institute, Tarnab Farms, Peshawar
2. Agricultural Research Institute, Sariab Road, Quetta
3. Arid Zone Research Institute, Brewery Road, Quetta
4. Ayub Agricultural Research Institute, Jhang Road, Faisalabad
5. Barani Agricultural College, Murree Road, Rawalpindi
6. Central Cotton Research Institute, Old Shujabad Road, Multan
7. College of Veterinary Sciences, Lahore
8. Faculty of Agriculture, Gomal University, D.I. Khan
9. National Agricultural Research Center, Directorate of scientific Information, Park Road, Islamabad
10. National Documentation Center, Library and Information Network (NADLIN), Islamabad
11. Nuclear Insitute for Agriculture and Biology (NIAB), Jhang Road, Faisalabad
12. NWFP Agricultural University, Peshawar
13. Pakistan Forest Institute, Peshawar
14. Sind Agriculture University, Tandojam
15. Tropical Agricultura Research Institute, PARC, Kharachi University Campus, Karachi
16. University College of Agriculture, Rawalakot, Azad Kashmir
17. University of Agriculture, Faisalabad
18. Fisheries Research and Training Institute, Lahore
19. Livestock Production Research Institute, Bahadurnagar
20. Agricultural Research Institute (North), Swat
21. Directorate of Agricultural Information, Lahore

Appendix 10

LIST OF PARTICIPANTS FUNDED BY MART FOR DEGREE STUDIES

	NAME	SUBJECT & UNIVERSITY	START DATE
1.	Shafiq Ahmad	Agronomy North Carolina State U.	8/29/88
2.	Mohmmad Rashid Ahmad	Agronomy Virginia Polytechnic	9/7/87
3.	Niaz Ahmad	Agricultural Engineering, Iowa State U.	08/17/87
4.	Quarban Ahmad	Ag. Engineering AIT, Bangkok	09/01/90
5.	Waqar Ahmad	Plant Pathology Washington St. U.	8/11/87
6.	Ghulam Akbar	Range Science Utah St. U.	9/23/91
7.	Maqbool Akhtar	Agronomy U. of Hawai	12/18/89
8.	Mohd Ramzan Akhtar	Ag. Economics U. of Nebraska	12/21/87
9.	Mohd Akhtar	Genetics & Plant Breeding, U. of Arkansas	8/24/91
10.	Mohd Akram	Plant Physiology Washington State U.	1/3/89
11.	Arshad Ali	Agronomy New Mexico State U.	8/14/89
12.	Asghar Ali	Agronomy Colarado State U.	8/10/90
13.	Iftikhar Ali	Animal Husbandary Virginia Polytechnic	09/07/87
14.	Mohammad Ali	Agronomy Michigan State U.	09/16/88
15.	Tanvir Ali	Agriculture/vocational Education U. of Minnesta	04/28/87

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16.	Irshad Ahmad Amin	Forest Ecology Utah State U.	01/04/88
17.	Faqir Mohd Anjum	Food Sciences Kansas St. U.	08/17/88
18.	Mohammad Ashraf	Production Agronomy Oregon State U.	03/23/88
19.	Mohammad Ashraf	Agriculture U. of Rhode Island	09/06/88
20.	Mohd Aslam	Agronomy U. of Missouri	8/21/87
21.	Mohd Ayub	Fisheries Auburn U.	8/20/88
22.	Khamiso Khan Baloch	Agronomy IRRI/Manila	06/10/82
23.	Qadir Bux Baloch	Plant Breeding/ Crop Sciences Mississippi St. U.	08/08/89
24.	Shabaz Bhatti	Food Technology North D/State U.	03/07/88
25.	Mohammad Rafique Bhatti	Forestry/Watershed Utah St. U.	09/22/88
26.	Behrulal T. Devarjani	Engineering Iowa State U.	01/11/88
27.	Abdul Hameed	Agronomy Iowa State U.	01/11/88
28.	Irshad Ul Haq	Dairy Science Ohio St. U.	12/29/87
29.	Abdul Majeed Haqqani	Agronomy IRRI, Manila	06/10/85
30.	Iftihar Hussain	Veterinary Micro/ Biology U. of Minnesota	09/15/88
31.	Manzoor Hussain	Veterinary Science/ Micro, Iowa State U.	01/07/88
32.	Syed Mohd Imtiaz Hussain	Veterinary Medicine Mississippi St. U.	08/19/87
33.	Makhdoom Abdul Jabbar	Animal Husbandry Cornell U.	08/25/87
34.	Nasim Javed	Animal & Range Sciences, New Mexico St. U.	12/29/87

35.	Isaac John	Biology Colorado St. U.	01/20/87
36.	Abdul Ali Kakar	Engineering Colorado St. U.	01/11/88
37.	Babar Raza Kazi	Range Sciences New Mexico St. U.	06/05/88
38.	Abdur Rahman Khan	Agronomy	08/20/89
39.	Dawa Khan	Agronomy	01/05/89
40.	Fateh Ullah Khan	Plant Pathology North Dakota St. U.	11/27/89
41.	Kanwar Nasir M. Khan	Veterinary Pathobiology	09/22/88
42.	Mohammad Anwar Khan	Crop Science Montana St. U.	09/21/87
43.	Sajjad Khan	Agronomy U. of Illinois	01/10/91
44.	Tariq Masood Khan	Agri. Economics U. of Kenticky	08/28/91
45.	Nafees Sadiq Kissana	Plant Breeding/Agro Colorado St. U.	08/30/87
46.	Khalid Mahmood	Agri. Economics Oklahoma St. U.	01/07/91
47.	Tariq Mahmood	Entomology U. of North Dakota	03/03/88
48.	Abdul Majid	Agri. Entomology Oregon St. U.	03/28/89
49.	Haq Nawaz Malik	Agronomy U. of Nebraska	08/19/87
50.	Shabnam Bahar Malik	Dev Anthoropology Cornell U.	08/21/88
51.	Muhammad Umar Mallah	Agri Education Ext Iowa St. U.	01/04/89
52.	Mujahid Masood	Food Technology Mississippi St. U.	08/22/88
53.	Kirshan Mehraj	Agronomy Colorado St. U.	08/22/88
54.	Abdus Salam Memon	Agri Economics Oklahoma St. U.	08/18/88
55.	Mohammad Umer Memon	Forestry Oklahoma St. U.	08/20/90

56.	Mohammad Umer Memon	Environmental Science Oklahoma St. U.	08/20/90
57.	Farasat Abbas Mir	Animal Science/ Nutrition, Ohio St. U.	09/15/88
58.	Imdad Hussain Mirza	Feed Process & Tech Oregon St. U.	09/04/89
60.	Sarwat Naz Mirza	Animal Sciences Utah St. U.	09/22/87
61.	Fida Mohammad	Plant Breeting & Genetics, U. of Idaho	08/26/91
62.	Ghulam Muhammad	Veterinary Medicine Ohio St. U.	12/29/87
63.	Noor Muhammad	Agronomy Louisiana St. U.	01/12/85
64.	Mohammad Nawaz	Animal Husbandry Oregon St. U.	09/29/87
65.	Shahid Niaz	Agronomy U. of Nebraska	01/04/88
66.	Iftikhar Hussain	Veterinary M-Biology U. of Minnesota	09/15/88
67.	Mohammad Abdul Quddus	Agri Economics Colorado St. U.	08/25/87
68.	Mohammad Javid Qureshi	Entomology Washington St. U.	08/24/89
69.	Abdul Rashid	Agronomy Iowa St. U.	01/11/88
70.	Zia-ur-Rehman	---- U. of Arizona	08/20/90
71.	Mohmmad Saleem	Agronomy IRRI/Philippines	06/10/82
72.	Mohammad Sawwar	Animal Husbandry Virginia Polytechnic	09/01/87
73.	Muhammad Sarwar	Agriculture Ohio St. U.	03/07/88
74.	Ajmal Haider Shah	Management Texas Technical U.	08/18/88

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75.	Nazeer Hussain Shah	Agronomy Kansas St. U.	01/08/88
76.	Syed Masoom Shah	Veterinary Science Auburn U.	01/05/88
77.	Mohammad Iqbal Sial	Forestry Colorado St. U.	01/06/86
78.	Atta Hussain Soomro	Agronomy U. of Kentucky	08/18/88
79.	Fazle Subhan	Agronomy/Wheat Breeding, Oklahoma St. U.	06/03/91
80.	Sheikh Suleman	Forestry New Mexico St. U.	08/28/88
81.	Muhammad Tahir	Agriculture Washington St. U.	01/12/87
82.	Abdul Wahid	Agriculture Oregon State U.	09/30/86
83.	Mohammad Yousaf	Irrig/Agri. Eng. New Mexico St. U.	01/21/88
84.	Shahid Mahmood Zia	Agri. Economics Oklahoma St. U.	01/04/89

Appendix 11

LIST OF MART-FUNDED SHORT TERM TRAINEES OVERSEAS

			mos	
1.	Abdullah	Agri. Research Tucson, Arizona	2.5	07/08/90
2.	Ali Ahmad	Agronomy U. of California	2.5	08/01/88
3.	Nazir Ahmad	Intergated Pest Mgt U. of California	1.00	08/06/90
4.	Saeed Ahmad	Agronomy Oregon St. U.	2.5	06/29/87
5.	Sarfraz Ahmad	Agriculture Study tour	1.50	07/30/87
6.	Shafiq Ahmad	Agronomy U. of California	2.50	08/01/88
7.	Syed Suhail Ahmad	Management U. of Connecticut	3.00	01/02/86
8.	Bashir Ahmad	Agriculture USDA/N.M. St. U.	2.5	05/20/85
9.	Riaz Ahmad	Animal Husbandry Iowa St. U.	2.50	06/29/87
10.	Zarar Ahmad	Animal Husbandry Iowa St. U.	2.50	06/29/87
11.	Ahmad Saleem Akhtar	Agriculture U. of Cal/Davis	9.00	09/22/86
12.	Muhammad Akhtar	Trg of Trg, Co-ordinators, Iowa St. U.	1.50	06/29/91
13.	Khurshid Alam	Agronomy Oregon St. U.	2.50	06/29/87
14.	Inayat Ali	Agronomy Oregon St. U.	2.50	06/29/87
15.	Irshad Ali	Agronomy CIMMYT	6.00	02/24/86
16.	Ahmad Khan Almani	Agronomy U. of Cal/Davis	2.50	08/01/88
17.	Malik Aman	Agriculture USDA	2.50	05/20/85

18.	Mohammad Amin	Agronomy	2.50	08/01/88
19.	S.M. Anees	Agriculture	2.75	07/13/87
20.	Abdul Qadir Ansari	Agriculture	0.50	04/14/86
21.	Noor Nabi Ansari	Agronomy Oregon St. U.	2.50	06/29/87
22.	Mohammad Anwar	Forestry USDA/U. of Arizona	1.00	07/20/87
23.	Mohammad Shafiq Anwar	Agronomy U. of Cal/Davis	2.50	08/01/88
24.	Muhammad Arshad	Agronomy U. of Cal/Davis	2.50	08/01/88
25.	Muhammad Asghar	Agronomy U. of Cal/Davis	2.50	08/01/88
26.	Ghulam Mustafa Avesi	Agronomy U. of Cal/Davis	2.50	09/08/87
27.	Qazi Tauqir Azam	Agriculture Yale U.	0.50	04/14/86
28.	Qazi Tauqir Azam	Devel. Economics Yale U.	12.00	09/10/89
29.	Manzoor Ahmad Bajwa	Agriculture U. of Minnesota	0.50	04/15/85
30.	Khuda Bakhsh	Agriculture USDA	2.50	05/20/85
31.	Mohammad Ajmal Baloch	Animal Husbandry Iowa St. U.	2.50	06/27/88
32.	Mukhtar Ahmad Baluch	Soil & Water Conservation, Utah St. U.	2.50	08/20/89
33.	Munir Ahmad Bhatti	Agronomy Oregon St. U.	2.50	06/29/87
34.	Muzaffar Iqbal Bhatti	Animal Husbandry IRRI, Manila	0.75	01/18/87
35.	Mohd Ali Bhutto	Trg of Trg Coordinators, Iowa St. U.	1.50	06/29/91
36.	Syed Javed Iqbal Bukhari	Agronomy U. of Cal/Davis	2.50	08/01/88
37.	Syed Saban Shah Bukhari	Trg of Trg Coordinators, Iowa St. U.	1.50	06/29/91

38.	Bashir Ahmad Bukhari	Agronomy U. of Calfornia	2.50	08/01/88
39.	Ashfaq Ahmad Butt	Agronomy Cornell U.	4.00	01/15/86
40.	Abdul Ghani Channa	Animal Husbandry Iowa St. U.	2.5	06/29/87
41.	Mohammad Qasim Chatha	Agronomy Iowa St. U.	2.5	06/29/87
42.	Khalid Masud Chaudhry	Agriculture U. of Wisconsin, Mads	2.50	06/06/88
43.	Muhammad Ibrahim Chaudhry	Agronomy U. of Cal/Davis	2.50	09/08/87
44.	Nazir Ahmad Chaudhry	Agronomy Cornell U.	4.00	01/15/86
45.	M. Bilal Ahmad Chowdry	Trg. of Trg Coor-dinators, Iowa St. U.	1.50	06/29/91
46.	Salahud din.	Agriculture USDA	2.25	06/01/87
47.	Salahud din	Agriculture U. of Arizona,	2.50	07/13/87
48.	Safarud din	Agriculture U. of Arizona	2.50	07/13/87
49.	Ramzan H. Habib Dossa	Agriculture Study Tour	1.25	08/22/88
50.	Malik Fazal Elahi	Agronomy Oregon St. U.	2.50	06/29/87
51.	Mohammad Baquar Farooqui	Agronomy U. of Cal/Davis	2.5	08/01/88
52.	Abdul Ghafoor	Agronomy Oregon St. U.	2.50	06/29/87
53.	Raza Ali Gill	Animal Husbandry Iowa St. U.	2.50	06/27/88
54.	Akbar Hussain Gurmani	Nutritional Aspects USDA/AUBURN U.	1.50	06/12/89
55.	Ghulab Habib	Agronomy U. of Cal/Davis	2.50	08/01/88
56.	Abdul Hadi	Seed Improvement U. of Arizona	2.50	08/01/88

57.	Abdul Hafeez	Management U. of CONN	2.50	06/05/85
58.	Abdul Hamid	Agriculture USDA	1.75	06/01/87
59.	Anwar ul Haq	Animal Husbandry Iowa St. U.	2.50	06/27/88
60.	Ehsan ul Haq	Agronomy CIMMYT, Mexico	5.00	01/29/88
61.	Iftikhar ul Haq	Agriculture USDA/OICD	1.50	07/28/86
62.	Mohammad Anwar ul Haq	Agriculture Economics, Howard U.	2.50	02/25/91
63.	Mohammad Amjad Hasan	Agronomy USDA,	0.50	07/21/86
64.	Zafar Hameed Hashmi	Equipment Mgt. Cornell U. Ithac	2.50	09/17/90
65.	Sher Hassan	7th Intl. Congr Virology, Edmonton, Canada	0.23	08/09/87
66.	Tariq Hassan	Trg. of Trg Co-ordinators, Iowa St. U.	1.50	06/29/91
67.	Taj Mohammad Hassani	Trg of Trg Co-ordinators, Iowa St. U.	1.50	06/29/91
68.	Amjad Hussain	Animal Husbandry Iowa St. U.	2.50	06/27/88
69.	Iftikhar Hussain	VP Problems & Solution, Colorado St. U.	0.50	07/20/87
70.	Manawar Hussain	Animal Husbandry Iowa St. U.	2.50	06/29/87
71.	Muhammad Hussain	Agronomy UC Davis	2.50	09/08/87
72.	Sajid Hussain	Management USDA	2.50	05/20/85
73.	Aftab Ikram	Com Graphics & Mgt U. of Illinois	6.00	01/23/89
74.	Javaid Iqbal	Animal Husbandry Iowa St. U.	2.50	06/27/88

75.	Mohammad Mahmood Iqbal	Animal Husbandry Iowa St. U.	2.50	06/27/88
76.	Mohammad Awaz Iqbal	Agronomy U. of Cal/Davis	2.50	08/01/88
77.	Zahid Iqbal	Agronomy U. of Cal/Davis	2.50	07/31/88
78.	Muhammad Islam	Soil & Water Cons. Utah St. U.	1.25	08/20/89
79.	Mohammad Ismail	Trg of Trg Co-ordinators, Iowa St. U.	1.50	06/29/91
80.	Ahmad Jan	Integrated Pest Mgt, Texas A&M U.	2.50	06/18/90
81.	Mohammad Tariq Javed	Animal Husbandry Iowa St. U.	2.50	06/27/88
82.	Atta ud din Kakakhel	Agronomy CIMMYT	5.00	01/29/88
83.	Fazil Karim	Agronomy UC Davis	2.50	09/08/87
84.	Anwar Saleem Kasi	Agronomy UC Davis	3.00	09/08/87
85.	Bashir Ahmad Kasi	Animal Husbandry Iowa St. U.	2.50	06/29/87
86.	Muhammad Azam Kassi	Animal Husbandry Iowa St. U.	2.50	06/29/87
87.	Iftikhar Hussain Khalil	Trg of Trg Co-ord. Iowa St. U.	1.50	06/29/91
88.	Ahmad Saeed Khan	Agriculture U. of Minnesota	0.50	04/15/85
89.	Kafeel Ahmad Khan	Animal Husbandry Iowa St. U.	2.50	06/29/87
90.	M. Azam Khan	Agriculture Study tour	1.50	07/30/87
91.	Manzoor Ahmad Khan	Agronomy U. of Cal/Davis	2.50	08/01/88
92.	Mohammad Afzal Khan	Soil Sciences USDA/Auburn U.	2.00	06/11/90
93.	Mohammad Iqbal Khan	Economics Colorado St. U.	0.75	01/02/86
94.	Mohammad Siddiq Khan	Agriculture USDA/U. of Minnesota	1.25	06/10/85

95.	Mohib ullah Khan	Agronomy UC Davis	2.50	06/10/85
96.	Muhammad Nawaz Khan	Agronomy U. of Cal/Davis	2.50	08/01/88
97.	Muhammad Saleem Khan	Trg of Trg Coord. Iowa St. U.	1.50	06/29/91
98.	Munawar Khan	Agronomy U. of Cal/Davis	2.50	08/01/88
99.	Muniruddin Khan	Agriculture USDA W. Texas U.	1.50	05/30/88
100.	Nasir Jabbar Khan	Poultry Production Land O Lakes	3.00	09/22/88
101.	Noor Ahmad Khan	Animal Husbandry Iowa St. U.	2.50	06/29/87
102.	Pordil Khan	Agronomy U. of Cal/Davis	2.50	08/01/88
103.	Salahuddin Khan	Agronomy U. of Cal/Davis	2.50	08/01/88
104.	Shafat Ahmad Khan	Management A D Little/MEI	1.50	06/27/85
105.	Waheed Sultan Khan	Agronomy UC Davis	2.50	09/08/87
106.	Zia Ullah Khan	Animal Husbandry Iowa St. U.	2.50	06/29/87
107.	Abdul Ghaffar Khanzada	Agronomy U. of Cal/Davis	2.50	08/01/88
108.	A. R. Kharal	Agronomy U. of Cal/Davis	2.50	09/08/87
109.	Ghulam Abbas Khuhro	Agronomy UC Davis	2.50	09/08/87
110.	Mohammad Khurshid	Agricultue U. of Arizona	2.75	07/13/87
111.	Imam Bux Koondhar	Agronomy U. of Cal/Davis	2.50	08/01/88
112.	**Mohammad Raza Lodhi**	Agronomy U. of Cal/Davis	2.50	08/01/88
113.	Meer Mohammad M. Mahar	Agronomy U. of Cal/Davis	2.50	08/01/88
114.	Fazal Mahmood	Trg of Trg Co-ordinators, Iowa St. U.	1.50	06/29/91

115.	Mohammad Tariq Mahmood	Animal Husbandry Iowa St. U.	2.5	06/29/87
116.	Abdul Majeed	Agronomy	2.50	08/01/88
117.	Abdul Majeed	Trg of Trg of Co-ordinators, Iowa St. U.	1.50	06/29/91
117.	Mohammad Umar Makhdoom	Agriculture U. of Arizona	2.75	07/13/87
118.	Abdul Malik	Agronomy U. of Cal/Davis	2.50	08/01/88
119.	Karim Bakhsh Malik	Management Louisiana St. U.	2.50	09/04/89
120.	Karim Bakhsh Malik	Agronomy Reg'l Sugarcane Trng Center	3.00	09/01/88
121.	Mahmood Niaz Malik	Agronomy U. of Cal/Davis	2.50	08/01/88
122.	Razzak Ahmad Malkana	Training USDA/W.D.C.	1.50	08/10/87
123.	Mohammad Yousaf Marwat	Agriculture USDA	1.75	06/01/87
124.	Rana Muhammad Masud	Agriculture U. of Arizona	2.75	07/13/87
125.	M. Yameen Memon	Trg of Trg Co-ordinators, Iowa St. U.	1.50	06/29/91
126.	Noorul Islam Mian	Agriculture U. of Minnesota	0.50	04/14/86
127.	Imdad Hussain Mirza	Int'l Rice Res Conf IRRI, Manila	0.17	11/07/88
128.	Mohammad Salim Mirza	Biology Int'l Plant Biotec. Netwk.	0.23	01/11/87
129.	Mohammad Sarwar	Flour Milling Tech.	3.00	05/08/88
130.	Abdul Qadir Mughal	Animal Husbandry Iowa St. U.	2.50	06/29/87
131.	Muhammad Siddique Munawar	Agronomy U. of Cal/Davis	2.50	08/01/88
132.	Muhammad Munir	Animal Husbandry Iowa St. U.	2.50	06/29/87

133.	Shahid Munir	VP Problems & Solutions, Colorado St. U.	0.50	07/20/87
134.	Chaudhri Mohammad Mushtaque	Agronomy UC Davis	2.50	09/08/87
135.	Naseen Muzaffar	Agriculture Different States	1.00	01/22/87
136.	S. Nankani	Trg of Trg Coordinators, Iowa St. U.	1.50	06/29/91
137.	Mujtaba A. Naqvi	Management U. of Minnesota/USDA	1.25	06/18/85
138.	Qayum Nawaz	Agronomy U. of Cal/Davis	2.50	08/01/88
139.	Muhammad Munir Nayyar	Agronomy UC Davis	2.50	09/08/87
140.	Aurangzeb Noor	Pest Mgt Program Texas A&M U.	2.50	10/01/90
141.	C. A. Ozair	Trg of Trg Coordinators, Iowa St. U.	1.50	06/29/91
142.	Iftikhar Hussain	VP Problems & Solutions Colorado St. U.	0.50	07/20/87
143.	Manzoor Ali Pasha	Mgt of Agri Res. OICD/USDA, W.D.C.	1.50	06/26/89
144.	Abdur Rehman Qazi	-		

Appendix 12

LIST OF MART-SPONSOR IN-COUNTRY TRAINING COURSES
July 1986-August 1993

S/No.	Description of Course	Duration Days	No. of Participants		
1986					
		Days	T	F	P
1.	Orchard Management	10 (Feb)	31	24	7
2.	Vertebrate Pest Management	14 (Mar)	18	3	15
3.	Seminar on National Agriculture	2 (Apr)	38	8	30
4.	Home Gardening for Ladies	5 (Apr)	39	10	29
6.	Range Management and Forage Production	12 (Apr)	31	10	21
7.	National Seminar on "Strategies for Rice Res. Production Development"	3 (Apr)	56	15	41
8.	Fourth National Bee Keeping	5 (Apr)	98	20	78
9.	Use of Statistical Software on Microcomputer MSTAT (4.0)	?	30	18	12
10.	National Workshop on Dairy-Cattle Cross Breeding and Maintenance of exotic dairy cattle	15 (Jul)	57	-	57
11.	Biometry	9 (Jul)	18	4	14
12.	Workshop on On-Farm Maize Research with a Farming System Prospectives: Diagnostic Survey	11 (Aug)	18	4	14
13.	Pesticide Chemistry and their Side effects	16 (Aug)	28	-	28
14.	Application of Statistics in Agricultural Research	13 (Oct)	26	3	23
15.	Diagnosis and Control of Sugar Crops Diseases	6 (Oct)	22	4	18
16.	National Workshop on Res. Extension Linkages for effective Technology Transfer	5 (Oct)	53	20	33

1987

17.	Plant Disease Diagnosis	19 (Jan)	29	8	21
18.	Technology Transfer for Extension Workers	26 (Jan)	33	2	31
19.	Vertebrate Pest Management	29 (Aug)	20	6	14
20.	Micro Computer Orientation & Use of Statistical Software Package MSTAT	13 (Oct)	22	-	22
21.	Integrated Insect Pest Management	12 (Nov)	19	8	11
22.	Pest Management of Rice Crops	17 (Jun)	30	-	30
23.	Symposium on Development of NARC Master Plan	3 days	100	78	22
24.	Testing and Evaluation of Farm Machinery	12 days	25	5	20
25.	National Weed Sciences Workshop	5 days	60	30	30

1988

26.	Research Proposal Preparation Workshop at NARC, SAU, Sindh, and FAU, Punjab	2 (Jan)	82	20	62
27.	Agricultural Science Writing	18 (Feb)	28	4	24
28.	Soil Physics	11 (Feb)	24	4	20
29.	Range Management and Forage Production	11 (Feb)	16	4	12
30.	Computer Modelling in Pest Management	8 (Mar)	17	2	15
31.	Fifth International Training Course on Biological Control of Pests	34 (Mar)	20	-	20
32.	Vertebrate Pest Management	19 (Mar)	11	2	9
33.	Farm Machinery Design and Development	12 (Jul)	10	1	9
34.	Mushroom Cultivation (Ladies)	5 (Jul)	20	-	20
35.	National Workshop on Designing & Making Graphics	10 (Jul)	31	8	23
36.	Mushroom Cultivation (Gents)	5 (Jul)	34	4	30

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37.	Agricultural Librarian Workshop	5	(Aug)	24	8	16
38.	International Training Course on Managing Soil and Water Resources for Sustained Agriculture	12	(Aug)	17	3	14
39.	Plant Diseases Diagnosis	11	(Aug)	24	3	21
40.	Recent Development in Animal Production and Health Res.	12	(Sep)	15	1	14
41.	Vegetable Seed Production	14	(Oct)	19	6	13
42.	Improved Weed Management	20	(Nov)	21	5	16
43.	Pesticide Application Technology on Major Fruit Crops, at SAU Tandojam	6	(Dec)	29	-	29
44.	Agriculutre Research, Livestock & Forestry Staff of Balochistan in Research Methodology	27	(Dec)	20	-	20
45	Biometric Training AZRI Quetta	5	days	16	-	16
46.	Inroduction to IBM-AT Computers - AZRI Quetta	3	days	20	-	20
47.	M-Stat Statistical Procedures	5	days	29	-	29
48.	Range Livestock Workshop - AZRI Quetta	4	days	14	-	14
49.	Video Production Technology Workshop - AZRI Quetta	1	day	17	-	17
50.	Planning for Effective Agricultural Communication Workshop - AZRI Quetta	1	day	17	-	17
	1989					
51.	Repair, Maintenance and Management of Scientific Equipment	5	(Feb)	13	-	13
52.	Vegetable Diseases Diagnosis & Control	10	(Mar)	16	4	12
53.	Vertebrate Pest Management	14	(Mar)	14	3	11
54.	Agricultural Photography/ Videography	5 5	(Apr) (Apr)	34	6	28

55.	Sampling and Analytical Techniques, Statistical Procedures, and Computer Application in Agricultural Research	12 (May) 19 (Dec)	39	10	29
56.	Research Management	13 (Jun)	23	6	17
57.	Workshop on Morphological Description in Sugarcane and Agriculture Characters	5 (Jul)	14	2	12
58.	Soil Resources Management	12 (Aug)	17	4	13
59.	International Training Course on Manufacturing Technology with Emphasis on Quality Control	68 (Oct)	21	6	15
60.	Use of Bio-Technology in Bovine Reproduction	19 (Dec)	13	2	11
61.	Improved Vegetable Cultivation and Management	27 (Dec)	12	2	10
62.	6 Training Courses WP 5.0 6 Training Courses Lotus 123 6 Training Courses dBase III	(Mar-Dec)	360	80	280
63.	Workshop on Introduction, Data Base and Spread Sheet Management - AZRI Quetta	6 days	25	10	15
64.	Range Management and Fodder Production	12 days	16	4	12
65.	Improving Presentation Through Better Graphics, Speech and Meeting Management	5 days	20	8	12
66.	Workshop on Soil Variability in Agronomic Research	5 days	180	30	150
67.	Agricultural Libraries Workshop/Conference	5 days	29	11	18
68.	Training Course for Sophisticated Equipment -UAF	6 days	16	-	16
69.	Research Project Planning and Formulation - SAU	12 days	30	-	30
70.	Statistics in Agriculture-SAU	12 days	30	-	30

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1990

71.	Vertebrate Pest Management	13 (Mar)	20	2	18
72.	Training of Trg Coordinator	17 (Mar)	18	2	16
73.	Advanced Agric. Photography	6 (May)	34	13	21
74.	Advanced video production and editing	6 (May)	28	7	21
75.	Management of Agric. Experiment Stations	18 (May)	27	5	22
76.	National Workshop on Integrated Pest Management in Pakistan	3 (Jun)	33	14	19
77.	Plant Biotechnology Telecommunication Symposium	4 (Aug)	126	26	100
78.	Agriculture Res. Planning	13 (Dec)	25	4	21
79.	20 Computer Courses		323	70	253
80.	Workshop on Morphological Description of Sugarcane and Agriculture characters	3 days	12	2	10
81.	Incountry Training for Agric./Livestock Research Staff of Balochistan in Research Methodology	4 weeks	25	-	25
82.	National Seminar/Workshop on Sugarcane Production	3 days	60	10	50
83.	Sugarcane Travelling Seminar	12 days	15	5	10
84.	Use of Biotechnology in Bovine Reproduction Research Management	6 days	12	-	12
85.	Workshop for Women Scientists in Agriculture Research	4 days	40	-	40
86.	On-Farm Livestock Trial Workshop	3 days	10	2	8
87.	Fruit Fly Management- NWFP	30 days	150	-	150

1991

88.	Training of Training Coordinator	(January)	20	2	18
89.	Word Perfect 5.1	6 (Feb)	16	4	12
90.	Word Perfect 5.1	6 (Feb)	16	4	12

91.	Word Perfect 5.1	6 (Mar)	16	4	12
92.	Introduction to Windows Application and Utility Software	11 (Mar)	11	4	7
93.	Computer Graphics	9 (May)	4	4	-
94.	SPSS PC + Clinic	7 (Aug)	8	2	6
95.	Library Automation under Inmagic Software	13 (Sep)	18	2	16
96.	Self Learning Courses; Introduction to Computer, DOS, WP 5.1, dBase III plus and Lotus	27 (Sep)			
97.	Advance Course on Statistical Procedures and Computer Applications in Agriculture Research	13 (Oct)	18	3	15
98.	**Training Workshop on MSTAT-C**	3 (Oct)	18	8	10
99.	**Information Transfer Course on Fundamentals of Agriculture Photography**	4 days	35	10	25
100	Management of Household and Ornamental Pests	4 days	20	20	-
101.	Vertebrate Pest Management in Pakistan	2 days	20	2	18
102.	Introductory Computer Graphics Course	6 days	25	10	15
103.	FSR, Orchard Management - ARS, Dohdial	5 days	34	-	34
104.	Lab. Instrument Repair and Maintenance	14 days	22	4	18
105.	National Workshop on Goat and Sheep Research and Development - Lahore	3 days	42	-	42
106.	Soil Research Management	12 days	25	5	20
107.	Weed Management	6 days	23	-	23
108.	Advanced Couse on Sampling, Analytical Tech., Soil Testing and Plant Analysis	12 days	20	4	16
109.	Research Planning Training Course at ARI Tandojam	12 days	30	6	24

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110. **Participation of 5 Scientists from PARC in nematology Conference**	10 days	5	5	-
111. Enrichment/preseryation of crop residence at farm level - UAF	5 days	12	-	12
112. Farmer Training in Animal Health - UAF	30 days			
113. Statistical Package for Social Scientists - D.I.Khan)	12 days	20	-	20
114. Pest Management Mango Crop UAF	6 days	31	2	29
1992				
115. Training of Training Coordinator	17 (Jan)	19	3	16
116. Computer Graphics and Slide Production	11 (May)	20	8	12
117. Statistical Procedures and Computer Application in Agricultural Research	13 (May)	20	4	16
118. MART Library Strengthening	(May)	21	6	15
119. Library Management Services Workshop	(May)	21	6	15
120. Library Automation in IN-Magic	(June)	20	6	14
121. Modern Library Methods & Techniques	(June)	21	12	9
122. Workshop on Banana Disease, Sindh	(Sept.)	93	-	93
123. Searching of International databases on CD-ROM	6 (Dec)	15	3	12
124. 7th National Training Course on Vertebrate Pest Management	13 (Sep)	17	2	15
125. Planning, Writing, and Producing AV/Video Modules	6 (Nov)	25	7	18
126. Research Planning & Marketing	6 (Nov)	5	5	-
127. Decision Tools for Pest Management	14 (Dec)	22	4	18

128.	International Data Base on CD-ROM	13 (Dec)	15	2	13
	1993				
130.	Lateral Thinking in Management	3 (May) 5 (May)	25	15	10
131.	Research Planning & Marketing	5 (Jul)	5	5	-
132.	Computer Hardware Maintenance and Repair	20 (Jul)	10	5	5
		Grand Total	4239	903	3336

Appendix 13

AGRIBUSINESS AGREEMENTS SIGNED BY PARC

TECHNICAL ASSISTANCE AGREEMENTS SIGNED
WITH THE PRIVATE AGRIBUSINESS FIRMS DURING 1990-91.

1.	M/s Shafco (pvt) Ltd, Islamabad (23-8-90)	Production of Virus-Free Seed Potato through Tissue Culture
2.	M/s Bio-Labs (pvt) Ltd, Rawalpindi (1990)	Production of Hydroperi-cardium Vaccine for Poultry
3.	M/s K&N's Poultry Farms, Karachi (18-10-90)	Establishment of Poultry Disease Diagnostic and Feed Testing Laboratory
4.	M/s Al-Younus Agro Industry, Rawalpindi (24-11-90)	Manufacture of Groundnut Thresher
5.	M/s Jaffar Brothers, Karachi (24-12-90)	Seed Potato Production
6.	M/s United Agro-Engineers, Daska (29-5-90)	Manufacture of Rice Thresher
7.	M/s Agritec, Multan (6-5-91)	Manufacture of Precision Planter
8.	M/s B.S. Insecticides, Rawalpindi (13-6-91)	Testing & Evaluation of NICOCIDE-40
9.	M/s FDI, Sheikhupura (8-6-91)	Training in the Manufacture of Quality Agricultural Machinery
10.	M/s Pak. Zaree Industries, Hyderabad (16-6-91)	Training in the Manufacture of Quality Agricultural Machinery

11.	M/s Javaid Engineering Co. Gujranwala (19-6-91)	Training in the Manufacture of Quality Agricultural Machinery
12.	M/s Sayyed Machinery, Lahore (6-6-91)	Training in the Manufacture of Quality Agricultural Machinery
13.	M/s Neelibar Feed Industry, Lahore (19-6-91)	Production of Low-Cost High-Nutrition Animal Rations
14.	M/s Makka Engineering, Fatehjang (1991)	Manufacture of Groundnut Thresher
15.	M/s. National Engineering, Nawabshah	Manufacture of Paddy Thresher
16.	M/s. Green Land Engineering Daska	Manufacture of zero-till drill
17.	M/s. National Engineering Nawabshah	Technical Assistance Groundnut Thresher
18.	M/s. Nowshera Engineering Co. Ltd., Nowshera	Farm Machinery
19.	M/s. Indian River, Quality Breeder, Rawalpindi	Livestock Education & Extension and Diagnostic Lab
21.	M/s. Al-Madina Engineering & Dairy Equipment	Milking Machine
22.	M/s. Zubair Associates Karachi	Farm Machinery
23.	M/s. Farm Aid Group of Pakistan (Pvt) Ltd.	Poultry Vaccine